NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

Abridged Report

on

The possibilities of employment in insurance in England.

A report of the American Foundation for the Blind on Insurance Underwriting has been carefully studied and a summary forwarded to and interviews obtained with the following experts in Insurance work with a view to discovering whether the conditions governing Insurance in America were similar to those in this country.

Mr. Sherriff, Provident Mutual Life Assurance Co. Ltd.
Dr. May, Prudential Assurance Co. Ltd.
Mr. Tallack, Commercial Union Assurance Co. Ltd.

In addition to the above enquiries, a questionnaire accompanied by a letter giving the principal results of the American report and setting out the objects of our research was circulated to every insurance Company. Some of the facts which are fairly widely agreed upon are mentioned below.

1. Differences between English and American Insurance.

Practically all the American Companies employ large numbers of whole time agents who are in effect salesmen and who are paid either a salary or commission or both. In this country however it is the general practice (especially of Life Offices) to obtain the bulk of their business from representatives who follow other occupations - such as Solicitors, Bank Managers, Accountants, Estate Agents etc.

Some of the large Industrial Offices employ a large staff of collectors who obtain the instalments due from policy holders by calling from "door to door"; a number of superintendents are also appointed to supervise this work.

The usual Life Offices employ a few salaried Agency Inspectors who interview the agents from time to time, their qualifications include a thorough training in the inside organisation of a Life Office and technical knowledge acquired in many cases from the courses of the Insurance Institutes; the work of these officials is both strenuous and difficult.

The handicap of a blind person would secure them, to some extent, the sympathy of their prospective clients and they could probably count on being given a fair hearing; but the Insurance experts were of opinion that this success might ultimately be very slight.

2. Some specific problems which would probably be encountered by the blind in Insurance.

(a) There would be considerable difficulties confronting a blind man who attempted the whole work in connection with a composite office; probably specialisation in the departments of Life or Comprehensive Household Insurance would be advantageous in the initial stages.

(b) Besides the translation of ordinary rates into Braille which in itself would be no small task, some method of quoting the unnumerable tables of surrender values, bonus figures, and pages of estimates would have to be found. The correspondence over these points might also be fairly large. The various methods used in America for overcoming these difficulties might be utilised or adapted, especially if a competent secretary were employed.

(c) The system of Records for English Insurance would be of a far more individual and intricate nature than those necessary in the American Insurance.

(d) The agent has to satisfy the company that the person is a suitable client. This would be difficult for a blind person especially when dealing with unscrupulous persons.

(e) The expense of personal assistance for the blind agent would be considerable, and the results obtained, at least for some long time, would not cover this outlay.

(f) The blind agent who commenced Insurance selling among his own friends and Blind Institutions would have to exercise great care in ensuring that his business was progressively developed and that too much reliance was not placed on the early results achieved. It was also thought by responsible persons in Insurance work that in the case of sighted people, the most satisfactory type of business is obtained by opening up new ground rather than by beginning with friends.

A considerable difference was found between the results obtained by the questionnaire method and the views of experts interviewed, who, taking a personal interest in the problem, were after careful consideration able to make the following suggestions which, on the whole, are sufficiently encouraging to justify further examination.

The replies from the questionnaire may be summarised as follows :

Number of Companies written to	89.
Total number of replies received	25.
Nature of replies :	
Impossible for the Blind.	7.
No Suggestions or Openings	11.
Possibilities but great difficulties	6.
Matter under consideration.	1.

During personal interviews it was suggested that there were possibilities for blind persons (more especially the partially blind) in English Insurance as independent agents on a commission basis. The difficulties in this kind of work were however stressed but it was not considered impossible for a highly educated and adaptable blind man.

It was suggested that the blind person should first make himself familiar with Insurance work by

(a) Reading the literature on the subject.
(b) Working for some time along with a sighted person in the office to obtain an idea of outside canvassing.

(c) Taking an approved course in the subject.
(d) The careful study of the most suitable departments of Insurance business (probably Life and Comprehensive Household Insurance).
(e) The study of the methods of rate quoting and record keeping etc. and the preparation of Braille or other notebooks suitable to the individual himself.
(f) The development of the ability to make social contacts (and of successfully presenting his arguments.

The blind agent would then be in a position to commence with the circle of his acquaintances and gradually extend his clientele and build up a satisfactory business.

In view of the general attitude however the difficulties in such an undertaking are not to be minimised. But although the conditions in English Insurance are very different from those in America it would seem quite possible for an intelligent and keen blind man of suitable personality to obtain an economic position which would both satisfy his desire for independence and give scope for the expression of his abilities in congenial ways.

The Imperial Insurance Department has declared itself in agreement with the proposal to employ the blind in industrial occupations (a policy which is not upheld in the regulation of the Accident Insurance Societies) provided that the Inspectors, technical and otherwise, of the Accident Insurance Societies in question are unanimously agreed that no special danger is attached to the employment of the blind in the trades under consideration (Order by the Imperial Insurance Office - Section relating to Accident Insurance of 5th April, 1917 I. U 51/71).

As difficulties lie in the way of the employment of civilian blind at the present time, owing to the fact that compulsory employment is limited to the severely disabled, or to persons severely injured by accidents, the Imperial Insurance Office has introduced an amendment in the Order, to the effect that in certain circumstances employers may consider the employment of civilian blind as satisfying the requirements relating to the compulsory employment of the disabled.

Herr Perls, Director of Siemensstadt, Berlin, has produced a film showing the employment of the blind in small building work at the Siemens - Schuchart factory. This film will be set at the disposal of anyone who desires to make use of it.

Berlin Nov. 1919.

Committee for Investigating possibility of work for the blind.

Given by the Head Office for the Care of the Disabled and their dependants in Brandenburg.

VON WINTERFELDT.

Berlin.

Provincial Director of Brandenburg.

10th January, 1923.

THE POSSIBILITIES OF EMPLOYMENT FOR THE BLIND

IN INDUSTRIAL OCCUPATIONS.

\+ + = Tested by the Committee and found profitable
\+ = Recommended by other Blind Centres as profitable.
o = Possibility of work good prospects.

I. Stone Work.

1 + Polishing of marble and serpentine stone.

II. Manufacture of Porcelain.

2 + + Moulding vessels from porcelain clay.
3 o The enumeration, wrapping up and packing of various articles.
4 o Drawing out of porcelain tube on a potters wheel.

III. Steel pen industry.

5 o Drilling of penholders with a machine.
6 o Shaping of pens in a bending press.
7 o Pen polishing.
8 o Packing of pens.

IV. Manufacture of metal buttons.

9 + + Drawing out of small metal plates.
10 + + Drawing out the upper parts.
11 + + Compression of buttons.
12 + + Rivetting of buttons.
13 + + Trimming of buttons.

V. Manufacture of incandescent lamps.

14 o Perforation of small plates of mica stone (by machine).
15 Glass knobs (calibre).

VI. Clock making industry.

16 + Tuning of striking mechanism.
17 + Testing of alarm clocks by means of an ear trumpet.

VII. Making of instruments.

18 + + Tuning.
19 o Assembling of parts of instruments.

VIII. Manufacture of optical instruments.

20 + + Manipulation of crude glasses.

IX. Workrooms for mass production, apparatus, tools and parts of machinery.

21 + + Laying of screws on perforated plates for the purpose of varnishing.
22 + + Acoustical testing of smelting plugs to the correct dimensions and giving a signal for the metal to pass through.
23 + + Expansion of small containers (motor industry).
24 + + Work on horizontal and vertical winding and cutting machine.
25 + + Cutting of wire by means of a foot lever press.
26 + + Work on a milling machine.
27 + + Work on a turning lathe.

28 + + Work on a drilling machine of one or more spools.
29 + + Pasting of asbestos ribbons and winding of same on rollers.
30 o Cutting metal rods into lengths (corset manufacture).
31 o Polishing corset busks.
32 + Stamping of driving wheel (lamp manufacture).
33 + + Bending and stamping by means of friction and eccentric presses.
34 + + (Simultaneous) manipulation of a semi-automatic turning lathe and a foot lever press.
35 + + Manipulation of two semi-automatic drill machines.
36 + + Manipulation of a semi-automatic milling machine.
37 + Smoothing of lock metal.
38 + Weighing of springs of self-loading pistols.
39 o Manipulation of machine for removing of oil from shavings.
40 o Manipulation of automatic circular polishing machine for pegs and rollers.
41 o Dividing of bars by means of a die (steel pen industry).
42 + Making of sand fillings to form the cavity inside casting moulds.
43 + + Putting together and manipulation of testing apparatus.
44 + + Screwing up bolts in sections for winding parts.
45 + + Drawing in screws in sections for winding parts (machine work).
46 + + Pushing metal sections into lustre clips followed by simultaneous drawing of two screws.
47 + + Drawing of three screws (simultaneously) in scale holder (semi-automatic).
48 + + Greasing of the inner parts of a tube with revolving brushes.
49 + + Testing of winding apparatus.
50 + + Mounting of eye glasses.
51 o Sorting of vessels.
52 + + Holing and stamping work with a revolving press.
53 + + Mounting telephone receivers.
54 + + Fixing metal parts on plates.
55 + + Rivetting with a hand lever press.
56 + Rivetting with a treadle press.
57 + Rivetting the joints of the type levers of typewriters.
58 o Drawing out of material for rods (cart wheel industry).
59 o Fixing of eyelets by means of a die (steel pen industry).
60 + + Packing of smelting plugs in cardboard boxes which have been folded together previously.
61 o Polishing of metal parts with endless bands.
62 + + Grinding with boring, filing and milling machines.
63 + Counting of identical parts.
64 + + Revision work under instruction.
65 + Finishing of master levers (type-writer manufacture).
66 + Testing of reverberators in telephone repair.
67 + + Lowering of cases to a fixed height (boring machine).
68 + + Stamping with eccentric press.
69 + Sorting of various parts.
70 + Compression of main springs (in various branches of manufacture).
71 + + Rubbing plates with emery paper.
72 + Testing steel by filing.
73 + Assisting in transport work, pushing carts etc.

74 + Mounting switches.
75 + + Coupling rivets on the turning lathe.
76 + + Packing work of various kinds.
77 + + Putting together connecting socket joints. (made of four pieces of iron).

X. Soap manufacture.

78 o Widening and rounding of tubes.
79 o Packing soap and washing powders.
80 o Manipulation of soap presses and punches.
81 o Bottle rinsing.

XI. Textile industries.

(including paper spinning).

82 o Handling of towel drying machine.
83 o Hand spooling.
84 o Employment in mixing and packing of spinning materials.
85 o Packing and counting of yarn tubes.
86 + + Finishing of nets.
87 o Laying springs.
88 o Untying knotted raw materials and turning sacks in the work of paper spinning.

XII. Repairing Mattresses.

89 o Darning.
90 o Stitching.
91 o Putting together wire bottoms of mattresses.

XIII. Paper manufacture.

92 + + Making packets containing a certain number of envelopes.
93 + + Perforating envelopes.)
94 + + Punching thumb holes.) Stamping work.
95 + + Punching and sticking folded boxes.)

XIV. Cardboard manufacture.

96 + + Folding cardboard (by hand).
97 + + Using stamping machines (machines for rounding off corners and cutting edges).
98 + + Manipulation of circular scissors.
99 + + Knotting of string on covers of cartridge boxes.
100 + + Making lids and fastenings of boxes.
101 + Folding cardboard boxes.
102 + Stamping holes in handles.
103 + Attaching lock rivets.
104 + Attaching with machine.
105 + Manipulation of machine for rounding and cutting edges.
106 + Making rims for cardboard boxes.

XV. Sweet and chocolate manufacture.

107 + + Wrapping up sweets.
108 + " " chocolates.
109 + Moulding of marzipan sweets (by the semi-blind).
110 o Group work for the packing of different commodities especially chocolate tablets.
111 o Making chocolate powder into packets, closing them up and packing them in cardboard boxes.

Tobacco Industry.

112 + + Sorting tobacco leaves.
113 + + Rolling cigarettes (hand work).

XVII. Shoe making.

114 + + Skewering the boots.
115 + + Tying boots with string.
116 + Binding together parts of heel.
117 + Twisting the leg of the boot for the upper part of the instep.
118 + Preparation of straps.
119 + Putting in eyelets with a hand apparatus.
120 + Testing strength of boot laces.
121 + Fastening together boot legs. Fastening front parts. Fitting riding boots with leather.
122 + Heel pressing with a hard press.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

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APPENDIX III OF

REPORT OF INVESTIGATION

for the

NATIONAL INSTITUTE FOR THE BLIND.

Visits to factories in search of

new processes suitable for blind employment.

As a preliminary we visited the Labour Exchange in Pentonville Road and learned from Miss Gate that the King's Cross industrial area is unsuitable for our purpose, consisting as it does very largely of small firms housed in antiquated premises.

The Shoreditch Labour Exchange was then visited and the sympathy of the manager (Mr. Young) enlisted. He suggested the names of several firms who might cooperate and he is willing to assist in any future developments in his area as follows:

(1) by making final arrangements for employment of the blind.

(2) by recommending suitable lodgings for blind persons who may subsequently be employed.

We discovered that the best method of approach to firms is to write to the Director or Secretary asking for permission to visit the factory. This method is much more fruitful than chance visits.

A detailed analysis of the Firms visited is given in the schedule attached. This contains information as follows:

(1) Name of Firm and address.
(2) Official interviewed.
(3) Suitable processes.
(4) Number of blind persons who might well be employed on these processes.
(5) Suitability of process to either (a) totally blind or (b) those with slight vision.
(6) Willingness (or not) of Firm to employ blind.
(7) Suitability of firm's promises to blind workers.

An Analysis is made of the psychological qualities desirable for success in the various processes. This is set out in detail with cross-reference to the general schedule.

Twenty-three firms were visited and fifty-nine new processes discovered. The names of the above firms are as follows:-

Murray's Sweet Factory.
Lipton's Cocoa Factory.
Auto Strop Company.
Price's Patent Candle Company.
Crosse and Blackwell.

National Institute of Industrial Psychology

REPORT--(Continued.)

Cundall Eve and Company. Box makers.
Meadow Dairy Company. Provision Merchants.
Home and Colonial Ltd. Provision Merchants.
Rothman's Tobacco Company.
Ardath Tobacco Company.
R. & J. Hill. Tobacco Company.
The Chiswick Polish Company.
Oxo.
Yardley's. Perfumers.
Langite Cork Company.
British Oxygen and Sparklets Ltd.
Ediswan's Electrical Works.
John Jaques. Sports Manufacturers.
Carreras. Tobacco Company.
Bryant and May.
Lisson's Wireless Works.
Bovril.
Perry's Steel Pen Works.

It will be noted that a good many of the Firms are willing to employ Blind persons. It must be explained that this is only a tentative willingness dependent on a good many factors, such as Trade Union attitude, safety, insurance, transport and so on. Our primary object at this stage was to find suitable processes and not vacancies, but there is every likelihood of the latter at some future date if the information supplied in the schedule is followed up by the National Institute for the Blind.

The following firms have refused admittance to their factory for the reasons stated.

Pepsodent Company. Goods manufactured in U.S.A.

Heinz. (Harlesden) No suitable jobs owing to highly seasonal trade and casual employment.

Davis's Feather Mills. Whitechapel:
"Cannot permit an enquiry into their methods as National Institute for the Blind is a competitor."

Macfarlane Lang & Co. "Work is dangerous."

McVitie and Price. "Cannot permit an inspection at present".

Waterlow's. Printers of London Wall.
"No repetitive work and every operation is checked by sight."

De La Rue. "Work of extremely confidential character; no facilities for inspection of factory."

Thos. Christy & Co. Upper Thames Street. ("Forhan's Dentifrice.")
"Could not employ blind."

Cremona Ltd. "Blind cannot compete with sighted pianoforte tuners."

Ponds Extract Company. "No actual factory work."
The following firms have been requested to cooperate:-

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REPORT—(Continued.)

A.D. Shades Ltd. (Lampshades)

Peerless Co. (Lampshades)

Fluxite Ltd. (Solder)

Quaker Oats.

Evans Pastilles.

Pears.

Virol.

Hovis.

Bradstreet. (Boxes)

W. Lambert. (Candle shades)

Oakeys. (Metal Polish)

W.H. Jones. (Plush toys)

Erard. (Screens)

Palmyra. (Raffia)

Padbury. (Pill boxes)

National Institute of Industrial Psychology

REPORT—(Continued.)

ANALYSIS OF PROCESSES SUITABLE FOR THE BLIND.

1. "Packing" and "Finishing".

This is a genetic term which covers a large number of final operations in Industry. For the purpose of blind labour we have selected only such packing as would be continuous, i.e. of sufficient volume to be purely repetitive and stationary as to working position.

Psychological requirements:

(a) High degree of finger dexterity and quick reaction (for the attainment of high speeds).

(2) "Application" i.e. capacity for sitting for long periods in one place.

(3) Median intelligence ~~score~~.

Such processes are those numbered 3, 5, 6, 12, 13, 14, 16, 17, 21, 22, 23, 29, 31, 34, 36, 43, 50, 53, 56. in the schedules pp 6-7

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2. Machine "Feeding".

This operation is the action of inserting various kinds of raw material into a machine. It is the least dangerous of any machine operation and calls for the repetitive and rhythmic placing of material into a slot, hopper, band or other type of 'feed'.

Psychological requirements:

No judgment is required, as the work is entirely unskilled. General psychological requirements as in (1) above, with possibly lower intelligence score.

Such processes are those numbered 1, 2, 18, 20, 30, 33 (for boy). See pp 6-7

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3. Lathe and machine work:

This work consists of operating various forms of lathes and presses, and involves (a) discrimination in the 'set' of the raw material inserted for the operation, (b) ~~lever~~ control by hand, foot, or power, (c) rapid ejection and re-setting. It would, of course, be essential that all such machines be made fool-proof before blind workers could be employed. This is usually effected by the introduction of double hand levers, so that the machine cannot work until both hands are away from danger zones.

Psychological requirements:

Good physical condition is necessary as the raw material is often either bulky or heavy and the handling is arduous.

National Institute of Industrial Psychology

REPORT—(Continued.)

Noise and bustle are factors to be considered and thus a 'nervous' type of girl would be unsuitable. An ideal girl for these jobs would be a 'stocky', placid, sanguine, and of median intelligence. "Speed" is usually not important as the machines often work at a slow rate.

Such processes are those numbered 4, 8, 9, 15, 19, 32, 37, 38, 44, 55, 57, 58, 59. See schedules pp 6.7

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4. Assembly. Similar qualities to Packing and Finishing. See processes 40, 4k, 42, 45.

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5. Hand-work.

(a) Unskilled.

These operations embody the minimum of risk to the blind and are probably the most satisfactory as introductory processes to general Industry. Such jobs would loosely be termed "monotonous" – but observation tends to show that persons of low-grade intelligence find them interesting (or at least, bearable). Working conditions vary on hand-work from place to place.

Psychological requirements:

Some jobs are performed standing, others sitting, but in either case the work is probably fatiguing and reguires good physical development: placid temperament: comparatively ~~low~~ intelligence does not need to be high.

Such operations are 7, 24, 25, 26, 28, 47.

(b) Skilled.

These operations would invariably require a training period so that the blind could enter the workshop with a reasonable amount of skill and speed acquired.

Psychological requirements:

Factory standard of physical condition: higher ~~scores in~~ intelligence ~~tests:~~ good finger dexterity: responsive: alert: 'sensitive' types.

Such operations are 10, 11, 27, 39, 46, 49, 51, 52, 54.

See pp 6.7.

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Name of firm	Address
Gen Inc.	[illegible] rings
[illegible] solids Drill Co., Inc.	Drill [illegible]
Marshall Eve & Co.	15-25 [illegible]
Bridges	Strat
Lambie Appl Co	Jeu Ohi
Fields Oxygen & Specialty Gas	Ang No.
Delaware Electrical Works	Por

National Institute of Industrial Psychology

REPORT--(Continued.)

Germany.

Attached to this Appendix will be found a copy of a report on the possibilities of employment for the blind in Industrial occupations issued from Berlin under the auspices of the Care for the Disabled Office.

This report deals with one hundred and twenty-two processes in seventeen different Industries, but there are no particulars as to,

(a) Suitability to the totally or partially blind.

(b) Suitability to male or female labour..

(c) Vocational fitness.

(d) Economic prospects.

The following is an analysis of this report.

National Institute of Industrial Psychology.

REPORT--(Continued.)

The Industries are as follows:

			No. of processes mentioned as suitable for the Blind.	
	B1	(1) Stone Work.	1	
A1		(2) Manufacture of Porcelain.	3	
		(3) Steel Pens.	4	
A5		(4) Metal Buttons.	5	
		(5) Incandescent Lamps.	2	
	B2	(6) Clock Making.	2	
A1		(7) Instrument Making.	2	
A1		(8) Optical Instruments.	1	
A34	B14	(9) Mass production Work.	57	
		(10) Soap.	4	
A1		(11) Textiles.	7	
		(12) Repairing Mattresses.	3	
A4		(13) Paper Manufacture.	4	
A5	B6	(14) Cardboard Manufacture.	11	Recommended in our Research.
A1	B2	(15) Sweets and chocolate.	5	Recommended in our Research.
A2		(16) Tobacco.	2	Recommended in our Research.
A2	B7	(17) Shoe Making.	9	Well known in England as industry for the Blind.
A57	B32	Totals.	Total. 122	

Note:- 'A' Followed by figure = Number of operations tested by the Committee and found profitable.

Note:- 'B' followed by figure = Number of operations recommended by other Blind centres as profitable.

National Institute of Industrial Psychology

REPORT--(Continued.)

Analysis shows that of this total fifty-seven operations are "found profitable" by the Committee, and thirty-two are found profitable by other Blind centres. The remaining thirty-three seem of doubtful recommendation.

The most suitable Industries seem to be:-

(1) Metal Button Manufacture. This appears to be the most valuable suggestion for further research.

(2) Paper Manufacture. Three of the four processes mentioned are ordinary mass-production machine tasks and so offer nothing strikingly new.

The rest of the Industries either offer very few openings or are not highly recommended.

Mass production work offers the largest field of all with forty-eight recommendations. These can be sub-divided as follows:-

Assembly work	9	operations.
Hand work	12	"
Machine minding	27	"

The hand and assembly work consists of counting, pasting, packing, sorting, finishing, weighing, and general assembly of parts and thus involves a high degree of attention, intelligence and discrimination on the part of the worker.

Machine minding (as stated in our summary of vocational fitness) requires the more stolid patient type that can remain tranquil under working conditions involving possible monotony and noise.

The Berlin Report emphasises that these recommendations are subject to the proviso that the Insurance Societies are unanimously agreed that no special danger is attached to the employment of the blind in the trades under consideration.

National Institute of Industrial Psychology

REPORT---(Continued.)

United States of America.

The Report of the Pennyslvania Institution for the Blind records the employment of 181 boys and 156 girls. Most of these are employed in the 'usual' occupations of blind persons but the following are specialised occupations of interest, with notes as to degree of blindness.

	Totally blind.	Partially blind
Boys.	Sight lost at age.	Sight lost at age.
Solicitor	from 13	
Cheese business		less than 2/60 before 5.
Chicken raising	between 5 and 13	
Chiropractor	from 13	
Driving Milk Wagon		2/60 before 5
Employment manager		2/60 to 6/60 before 5.
Entertainer	before 5	
Jobber in groceries	from 13	
Kitchen help		2/60 before 5
Salesmen (2)	(1) before 5 (2) 5 - 13.	
Newstand	before 5	
Ranch	5 - 13	
In 'seeing' factories		(3) less than 2/60 (6) 2/60 to 6/60
	(3) totally blind	

Ten out of these 12 boys lost their sight before 5 years of age.

Girls.

7 working in 'seeing' factories. 4 totally blind - before 5.
3 2/60 to 6/60 - before 5.

The following are new occupations suggested by blind pupils:

(1) Tying bows on chocolate boxes.
(2) Lift operating.
(3) Plumbing.
(4) Supervising a boarding-house.
(5) Packing stationery.
(6) Raising canaries.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

329, High Holborn, London, W.C. 1.

Feb 24, 1928

SECOND REPORT OF INVESTIGATION

FOR

THE NATIONAL INSTITUTE FOR THE BLIND.

Summary

I. SCOPE OF THE INVESTIGATION. (p.1)

II. DETAILS OF ENQUIRIES MADE. (pp.1-6)

1. Visits to Institutions and Workshops.
2. Experiments in other Counties.
3. Visits to Factories.
4. Experiments at Swiss Cottage Workshop.
5. Surveys of Workshops.

III. RESULTS OF OUR ENQUIRIES. (pp.6-9)

IV. PROBLEMS OF THE EMPLOYMENT OF BLIND PERSONS IN FACTORIES AND WORKSHOPS.

National Institute of Industrial Psychology

REPORT--(Continued.)

I. SCOPE OF THE INVESTIGATION.

This investigation was begun in September 1927 on behalf of the Appointments Board of the National Institute for the Blind. The general scope of the enquiry was broadly discussed at the first meeting of the Placement Committee on July 13, and the Institute has devoted its attention principally to the problems brought forward at that meeting. These fall under two heads:

1. The study of occupations which blind persons might successfully enter as a step towards finding additional avenues for their employment. Three categories or classes of occupations were mentioned.

(a) Occupations of the factory type for which the less intelligent or less skilful blind persons might be effectively trained.

(b) Occupations requiring considerable skill including the majority of those now practised by blind persons.

(c) Occupations requiring higher intelligence and general educational qualifications than those falling under (a) or (b), suitable for persons who have received an advanced education (either before or after the onset of blindness.)

2. The study of existing workshops and processes in which blind persons are employed, so that any suggestions as to lay-out, methods of working, etc, which the Institute's industrial experience might enable it to make, could be placed at the disposal of those concerned.

II. DETAILS OF ENQUIRIES MADE.

From the outset we regarded the first-mentioned group of studies as the more important and accordingly devoted the greater part of our time to them.

1. Visits to Institutions and Workshops. Visits were paid to the principal Training Institutions and Workshops in and near London, and the nature of the employments in which blind persons are at present engaged was studied in some detail. Subsequently visits were paid to the workshops at Leeds, Bradford, Sheffield, Manchester, Birmingham, and Leicester; but no marked departure from the methods and processes employed in the London workshops was discovered. In fact the general uniformity in the nature of the employments carried on and in the methods of working was a rather striking feature of the workshops visited. Presumably similar conditions prevail throughout the country.

It is true that in some respects the workshops all possessed an individuality of their own, but it was generally only expressed on comparatively minor processes. Some institutions, for instance, had developed a local market for some specialised product which they alone were manufacturing. But in general, all the workshops were primarily occupied in producing the baskets, mats, machine knitted goods and other well-proved products with which the blind have been for so many years associated.

National Institute of Industrial Psychology

REPORT--(Continued.)

As to whether this is an advantage or otherwise more will be said later; but it was an advantage from the point of view of this enquiry, in that it reduced the time needed for a detailed study of the existing occupations practised by blind persons. Indeed, apart from the very small number of English experiments in finding new kinds of employment, such as those mentioned in the pamphlet "Placing the Blind in World Industries," it might be said that a clear field exists for research work in these problems.

2. Experiments in other Countries. The Experiments in other countries were also carefully examined. There is undoubtedly a considerable amount of information available concerning occupations successfully undertaken by the blind of other countries, but for the most part it lacks definiteness in the most important particulars. It must be apparent to everyone who is concerned with the welfare of the blind that "blindness" is not necessarily total and that the skill of a particular "blind" person may be due to a number of factors each of which requires consideration. Thus, the expert blind mechanic may not only be able to see a little, but, in addition, he may have received a training before he became "blind" which serves him well in his new occupation. In our opinion it will be very unwise to make high claims as to the capabilities of blind persons on the reports of achievements in other countries. Before doing so, more exact information concerning their previous training and their degree of blindness should be gained.

It was because we recognised the importance of a detailed study of all the circumstances of any particular case that we took steps, at quite an early stage of our enquiry, to arrange an experiment under controlled conditions. This need was several times brought home to us during our preliminary visits to workshops. It is doubtless valuable from a propaganda point of view to impress visitors with the wonderful skill or intelligence of some particular pupil or workman; but if the visitor happens to have some knowledge of the way the human mind works the eulogy is likely to fall flat. We heard several stories of remarkable talent, but in the instances we were privileged to observe personally it was clear that this talent was exaggerated. Perhaps because the general average tends always to be low, the really outstanding blind pupil or workman probably gets more than his proper proportion of esteem. This is a pity, especially if exaggerated notions of the general capacity of blind persons result. Such a policy is doubtless successful in appealing for funds; it is not likely to succeed when the appeal is for employment.

3. Visits to Factories. Having made rough analyses of the work already done in the workshops for the blind, visits were paid to factories in order to explore the possibilities of the factory employment of blind persons. Mr. Angles commenced these visits; they were subsequently continued by Miss Bevington and finally by Mr. Angles again. The results are given in an appendix.

Appendix III

National Institute of Industrial Psychology

REPORT--(Continued.)

4. Experiments at Swiss Cottage. From one of the earliest of these visits there arose a suggestion for the experimental employment of blind persons on a repetitive factory process, and a definite offer of work for a short period on a sub-contracting basis was eventually obtained from the manager of a factory who was sympathetic to the object of our enquiry. With the kind cooperation of Dr. J. M. Ritchie, arrangements were made for this experiment to be carried out at the Swiss Cottage workshops. It lasted nearly three months. Twelve girls who were receiving training in knitting were given instruction in the new process; and records were kept of their rate of improvement with practice from day to day and from week to week.

The repetitive process employed was one which is commonly found in telephone manufacture. It consists in "forming" or fastening together a number of wires in such a way that, when the completed "form" is inserted in the part of the telephone for which it is intended, the necessary connections can at once be made. The wires used are of varying lengths and colours, and a wooden board with the holes bored at appropriate points is used to control the position of each wire in the finished "form". The wires are threaded through the holes according to a fixed scheme and then bound together with waxed thread.

The detailed results are given in appendix II, but it may be added here that additional information concerning the experience and ability of the girls employed was considered necessary and steps were taken to measure

(i) The visual acuity

(ii) The degree of general intelligence

(iii) The manual dexterity

of the girls. The methods used in getting the information are described in Appendix I.

5. Surveys of Workshops. The studies mentioned under I (2) were originally suggested by Dr. Ritchie, but it became apparent at quite an early stage that very few of them were really desired. This point was raised at the Placement Committee's meeting in September when it was arranged that a private report should be furnished to the workshop if it desired to have one, while a general report only should be sent to the National Institute for the Blind.

Pressure of other work resulted in the postponement of these studies until January; but by this time the obstacles had increased. One workshop was completely disorganised by events of a serious nature, while in others the conditions were not suitable for a detailed study. The following workshops were revisited with this object in view:-

London Association. Warwick Street.

Waterloo Road.

Swiss Cottage Knitting Shop.

Barclay Workshop.

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A private report has been sent to Dr. Ritchie, while Captain Pollard of the London Association has suggested that we might be of assistance in rearranging certain matters of routine. Although, from what we have seen, there appears to be considerable room for improvement in matters of detail in organisation, lay-out, distribution of supplies and so forth, it is perhaps advisable at the present stage not to emphasise this fact. Perhaps as the value of systematic enquiry becomes more fully appreciated, a more general desire for assistance in these matters may be developed.

III. RESULTS OF OUR ENQUIRIES.

The results of our enquiries may be dealt with conveniently under two heads.

(a) The conclusions to be drawn from the Swiss Cottage experiment.

(b) The experience gained through visits to factories and workshops.

(a) The Swiss Cottage experiment.

The tables of data obtained in the Swiss Cottage experiment are given in an appendix. The number of cases is small and consequently the conclusions are only tentative; but some rather striking points emerge.

Psychological analysis shows that skill in carrying out a movement depends both upon a muscular control which is independent of vision, and upon a visual control. In writing, for example, although the movements are almost automatic, vision controls the alignment of the writing and prevents degeneracy in the form of the letters. It is well known that a blinded man's handwriting degenerates considerably even when other controls such as raised lines are used.

It would seem therefore that a blind person can acquire high degrees of skill only in those activities which are truly independant of vision in the sense that effective substitutes for visual control can be developed. The Swiss Cottage experiment fully confirms this belief. Those who became most proficient in the bell-set forming work were those who retained a sufficient degree of vision to identify colours and forms. To what extent they actually used their eyes it is impossible to say but their superiority in output can hardly be due to chance. Even a little assistance in the location and identification of objects will materially reduce the time spent in completing a series of manual operations. This is even more clearly demonstrated by the tests of manual dexterity. In two of those tests pegs (narrow cylinders of wood) are taken one by one from a box and placed in holes in a wooden board. In another test nuts are screwed on to small bolts, the bolts being in a pile to the left of the worker, the nuts in a pile on the right. In the fourth test a similar screwing movement is

employed, but the article is much larger (a double-ended wire strainer) and there is no picking up and transfer of objects from one position to another. It is quite clear that the time taken by a totally blind person is much greater than that taken by one who can see a little, simply because the latter spends so much less time in groping for his material. Although this groping may be much reduced by suitable lay-out and special apparatus, it cannot be removed altogether, and the resulting output of the blind worker must be correspondingly reduced. The differences between the groups in tests, a, b, c, show this quite clearly. But in test d, (wire strainer) the totally blind are as good as the others, and quite equal to the average for an ordinary elementary school group of pupils.

These results indicate that the suitability of a particular process in a factory must be very carefully considered. It is not just a question of "Can a blind person do the work"? - for there are clearly many processes which even the totally blind worker will be able to do - but at a very low rate. The important point is rather - what is the influence of vision in maintaining high output, and what percentage of an average output can be expected from a person of defective vision? It is clear that there are two factors to consider, - the nature of the process itself, and the degree of vision (and also manipulative skill) of the person to be considered for the work. It is by no means certain that because some "blind" workers have become 80 per cent efficient (or approximately so) on work of certain kinds, a general claim may be made for the employment of blind persons in industrial processes. Rather must we examine the conditions of the work in which such a high efficiency was attained, as well as the training, experience and qualities of those who reached it.

Considerations such as these suggest that we need a classification of occupations and processes according to their dependence upon vision, indicating what degree of proficiency may reasonably be expected from (a) partially blind (b) totally blind workers. The beginnings of such a classification are given in appendix IV.

These results also suggest how "lay-out" and "bench arrangements" in existing workshops may be improved.

(b) Visits to Factories and Workshops.

From our visits to factories and workshops we have obtained,

(a) A list of processes suitable for the employment of blind and partially blind persons.

(b) A list of firms who are willing to consider the employment of blind persons under suitable conditions.

These lists are given in the appendix.

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But in the course of these investigations a number of important questions concerning the employment of blind persons were raised and we were compelled to give considerable attention to them. These are more fittingly dealt with in a separate section.

IV. PROBLEMS OF THE EMPLOYMENT OF BLIND PERSONS IN FACTORIES AND WORKSHOPS.

We found a considerable variety of opinions regarding these problems among those engaged in caring for the blind, although the occupations carried on in the workshops were generally limited to the customary trades of basket making, mat weaving, knitting, hand-loom weaving, chair caning, etc. Possibly lack of agreement arises from the peculiar difficulty of the problems; it may also be due in part to the very remarkable independence of aims and outlook of the existing institutions and workshops.

There seems to be a strong desire to find employment for blind persons in the ordinary occupations of the community; and there is a not unreasonable belief that, if the prejudices of the employer can be successfully overcome, many fresh avenues for the employment of blind persons are to be found. Various reasons have been put forward in support of this movement, but one of the principal influences is undoubtedly the growing pressure upon the resources of existing workshops combined with the very limited scope for further expansion. Be that as it may, in seeking employment for blind persons in ordinary life it must be made quite clear what advantages will accrue both to the worker himself and to those who are responsible for his welfare, what difficulties he and they must be prepared to overcome, and what special arrangements, if any, an employer will be called upon to make if he undertakes to employ blind persons.

The alternatives to the development of opportunities for blind persons in ordinary employment seem to be two:-

(a) The development of new industries in or in connection with existing workshops for the blind, to be carried on under conditions of manufacture and sale similar to those at present in vogue.

(b) The development of new industries on a sub-contracting basis, arrangements being made with some commercial firm for the manufacture under contract of some necessary article by processes carried on in workshops run mainly by blind labour.

The former alternative has engaged the attention of several responsible officials and one or two "new lines" such as knitting needles, rubber mats, net bags are being developed; but the opportunities obviously are few. The second alternative seems more promising since it does not depend upon the discovery of "new" industries; but it too

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presents obvious difficulties. Factories willing to sub-contract may not be easy to find, while the cost of managing such an undertaking may be considerable. On the whole it would seem cheaper to place blind persons "out".

Attitude of the Worker. This raises a whole series of questions concerning what is and what is not desirable from the point of view of the blind worker himself. The present system provides employment in "sheltered" industries; the blind workman employed by a workshop does not feel the ordinary competition of industrial life; his earnings, being supplemented by grants, give him sufficient to support himself decently. The psychological effects of this are undoubtedly considerable. There are not the customary spurs of ambition and monetary need to increased output; and although a few (temperamentally "triers") may invariably work at their full capacity, the general level of endeavour is probably lower than it might be. On the other hand, there are positive advantages in continuity of employment, in association with those who understand fully the needs of blind persons, and so forth. As individuals differ greatly, it is probable that the concentration of the blind in workshops is suited to the psychological needs of a good many, though here and there will be found individuals who would benefit from the 'rough and tumble' of a less sheltered life. Probably most of those who are already employed in workshops for the blind would not care to find employment outside; but this might be worth enquiring into. If so, the search for additional employments chiefly concerns the next generation of blind persons.

Attitude of the Employer. But assuming that a considerable number of blind persons desire employment in ordinary life, what is the employer's attitude? It appears from our enquiries that the following factors influence the employer in refusing to consider the employment of blind persons:-

(1) The employer prefers to discharge his moral responsibility (if he feels it) by making a donation to one of the numerous funds for the blind.

(2) The lay-out of his factory may not be suitable for the employment of blind persons.

(3) The processes in his factory to which blind persons may be put are perhaps limited, and he desires the "handy-man" type of employee. The employment of a blind person might necessitate re-organisation. (This could be got over, but there are difficulties; for example, the processes upon which the blind are engaged would have to come at the beginning, for very often the finishing processes include inspection; moreover, speed of output in relation to the group is also important).

(4) Extra insurances and safeguards might be necessary.

(5) Employer might be concerned in transport of the blind workers.

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REPORT--(Continued.)

(6) Longer time may have to be spent in training the blind workers, and the employer suspects that the resulting efficiency will not be high enough. (The latter difficulty can be overcome, the former may make it desirable for some Placement Agency for blind persons to undertake their training, or to guarantee their efficiency to the employer.)

All these affect the employer in his outlook towards the problem; but there are other difficulties which might develop afterwards, such as:

(7) Poor time-keeping. No employer will permit frequent and irregular absences from work. These appear to be common in workshops. If they are irremediable, the movement will soon break down.

(8) The absence of augmentation of wages would make the worker dissatisfied, though this could be got over. (The National Institute for the Blind, for instance, might continue its assistance).

(9) The effects of the work itself. It is possible that the placing of blind persons singly or even in pairs in ordinary factories will result in a feeling of strain due to the rush of the factory and the isolation. This has already occurred in the case of a girl placed by the National Institute for the Blind.

None of these difficulties is of course insuperable, while on the other hand there are positive advantages to be gained from working under ordinary conditions, - such as the psychological benefits of wider social contacts, increased output through competition and suggestion, and a greater sense of independence and "victory over blindness".

1. Sub-contracting as an alternative.

Sub-contracting, however, would give a wider choice of work without the anxieties of capital invested in raw material or the disposal of finished stocks. But such work would be confined to repetitive work of comparatively low grades of skill, and it is doubtful, therefore, to what extent it would be worth while to develop it alongside the existing occupations. It seems pretty clear that there are to-day a considerable number of persons attempting to learn the skilled trades of weaving, basket making, etc., who are not capable of reaching reasonable efficiency. These could be employed profitably on repetitive work; not only would their earnings be proportionately greater, but the average output of the existing workshops would be raised and they would become correspondingly more profitable. It seems unnecessary in these days to stress the importance of a study of individual differences, but it does seem as if the present practice of the workshops for the blind was based upon the old belief that any person could in the long run be trained to acquire skill in a manipulative

activity. The meagre results achieved in many instances are a strong argument for the introduction of tasks of a lower grade kind such as would be available in a workshop which undertook sub-contracts. It is true that expense would be incurred in equipment and plant; but this would be offset to some extent by the increased earnings per head of the other departments.

But the question cannot be settled by abstract argument; it partly turns upon the existence of (a) processes suitable for sub-contracting, and (b) employers willing to give out work on reasonable terms. Further enquires must be made before the extent of the opportunities can be gauged.

2. Suitability of the Worker.

But at the root of the whole problem of employment is the suitability of any given worker for the employment in question. Whether we believe that it is better and cheaper to collect all the blind within a given area in centralised hostels and workshops, or to place them out in small groups in ordinary life, we cannot avid considering the suitability of the individual for the work proposed.

We have seen that partial vision plays a part in manual processess of certain kinds; but experience, training, intelligence, acquired knowledge and skill also deserve attention. Moreover, traits of temperament and character deserve special study; for the success of a person at his work depends upon these, as well as upon his knowledge and skill. It would be a mistake, for instance, to send a person who temperamentally needs encouragement and protection, to struggle in the 'rough-and-tumble' world of the factory. Not only would the effects on the individual be harmful; employers would be inclined to refuse further facilities. Hence wherever an opening is found, the person recommended for employment should be most carefully chosen. It cannot be said that as yet the principles of choice are fully established. Further study of the peculiar aptitudes and abilities of blind persons is necessary; and this requires many careful researches. The best place to begin is undoubtedly in the training school. But a start can even now be made along lines indicated by the experimental enquiries so far described. The National Institute of Industrial Psychology already possess a department in which advice may be sought; and arrangements could easily be made for its services to be placed at the disposal of the National Institute for the Blind or associated bodies.

3. Localisation.

One other problem deserves attention. It may happen that there may be no suitable candidate in a locality in which an opening for employment has been found. It seems desirable to set up some organisation for coordinating the needs of blind workers who desire employment, with the openings which are offered, and for finding suitable residential accommodation when such is required.

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Concluding this brief survey of the problems of finding suitable employment for blind persons, we desire to express our opinion that no single scheme or plan can be of universal application. It seems to us that each area must deal with these problems in relation to its own peculiar conditions. In some districts it may be easy to arrange work on a sub-contracting basis; in others it may be desirable to place as many persons "out" as possible. But we believe that much could be done to assist the responsible authorities by investigating further the suitability of different occupations for the employment of blind persons in relation to one or other of the plans above mentioned; and we think that experimental enquiries into selected processes on a sub-contracting basis would be fruitful in results. The Swiss Cottage experiment showed that a reasonable earning capacity could be reached within a comparatively short period; but this is only one type of activity, and the number of workers was small. More work of this kind is needed before any complete solutions of these problems can be formulated.

We suggest the following lines of investigation for the future:-

(1) Continuation of the study of occupations suitable for blind persons with greater attention to their psychological requirements. From the results of this study should be compiled lists of occupations suitable for totally blind and partially blind persons according to the character of their training, experience, and mental and physical capacities.

(2) Continuation of the search for employers willing to employ blind persons, the placing of blind persons in such employment and the careful study of results. (Detailed records to be kept).

(3) An experimental enquiry on a sub-contracting basis to investigate

(a) time taken to become efficient.
(b) amount of training needed and best methods.
(c) practical problems of cost.

(4) The fundamental problems of the psychological differences between blind and seeing which bear upon their suitability for employment of one kind or another.

(5) In due course, and as opportunities offer, the improvement of existing workshops, methods of training, etc. in the light of the above enquiries.

24th February 1928. Director.

3a.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

329, High Holborn, London, W.C.1.

THIRD

REPORT OF INVESTIGATION

FOR

THE NATIONAL INSTITUTE FOR THE BLIND,

224, Great Portland Street,

London, W.1.

Mechanical Dexterity Tests

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I. INVESTIGATIONS INTO PROBLEMS OF WORKSHOP ENVIRONMENT.

1. General Description of Investigations.

The Institute's last report (with appendices) dealt with the results of investigations carried out between September 1927 and March 1928. This report covers the period March to September 1928 inclusive.

i. Scope of the Investigation. It will be recalled that when the Institute's last report was discussed by the Placement Committee it was agreed that, although further studies of occupations suitable for blind persons and a further search for employers willing to employ blind persons were both desirable, it was advisable, for the present at least, to pursue certain lines of enquiry suggested by the results of the Swiss Cottage experiment in bell-set forming. This experiment and the psychological tests which formed part of it seemed to warrant the conclusion that one of the factors in securing efficiency in a manual occupation is the degree of residual vision possed by the worker. If this were indeed the case, it would mean that in the search for fresh avenues of employment for blind persons cognisance would have to be taken of the extent to which certain occupations could only be satisfactorily performed by the partially blind worker, the totally blind worker perhaps being unable to become highly efficient in them. It was realised that a very grave disservice might be done to the cause of the blind generally by urging employers to give employment to the blind indiscriminately, without ascertaining the extent to which a satisfactory level of efficiency (from the employer's point of view) could be reached or how long it would take to achieve it. At the same time the statement in the last report "that in any movement in which speed of locating the position of an object is an important factor even a small degree vision may be of assistance" seemed to be regarded by several

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members of the Placement Committee as entirely contrary to the general experience of those who have taught and trained blind persons. Similar views have been encountered also in the workshops where it appears to be often stated that the totally blind workman is equally as efficient as the partially blind workman. It is true that within recent months we have met several responsible officers who hold a contrary view, but on the whole we have not been encouraged to think that these questions have been faced in a sufficiently impartial manner. Even if it were demonstrably true that the totally blind on the whole are as efficient (1) as the partially blind in the occupations now carried on in the workshops for the Blind, it by no means follows that the same will hold of the newer processes which may be found available for them in industrial life. On the other hand, as the investigations here described show, the general belief in the equality (as regards efficiency) of different classes of blind persons cannot be justified even in their present occupations; this being the case it certainly seems that the approach to employers needs to be very carefully made. So much in anticipation.

At the date of the last report these implications of the Swiss Cottage experiment were fully realised but the data obtained therefrom were insufficient to justify any conclusion. Hence it was deemed highly desirable to seek confirmation of the results of that experiment by enquiries at workshops in which a reliable objective measure of efficiency could be secured. Mr. H.J. Wagg kindly placed facilities at our disposal at the Barclay Workshops for Women and our first studies were carried out there.

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(1) Efficiency here is used to include both the speed and the quality factors. Probably in the opinions above mentioned the quality of work has been the dominant factor.

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Subsequently, other workshops were chosen after consultation with various officers of the National Institute for the Blind and of the Ministry of Health. The Superintendents of the following workshops were extremely helpful and cooperative;

The London Association's Workshops for Women at Bickley.

The Swiss Cottage Workshops (men).

The Waterloo Road Workshops (men).

The Birmingham Workshops (men).

Altogether the wages records of 173 men and 43 women have been studied while tests of manual dexterity have been applied to 181 men and 96 women. In all cases it was desired to compare the earning capacity of the totally blind and the partially blind workers and the influence of vision in the tests used in the earlier experiment at Swiss Cottage. The examinees were also grouped according to trades partly because the wage conditions differ from trade to trade and partly because it was thought possible that differences due to the nature of the work for which they had been trained might show themselves.

The trades followed by the persons studied were as follows:

Men -	Women -
basket making	basket making
mat making	mat making
brush making	brush making
chair caning	weaving
boot repairing	typing

ii. Method of Investigation.

(a). Study of Wages Records. The amounts paid weekly to each worker (exclusive of augmentation) were abstracted from the wages records for as long a period as could be conveniently obtained. In most cases records covering two years or more were available so that it was possible to compare the average weekly wage earned by each worker during the last quarter under review with his average wage during the corresponding quarter two years or one year previously. It was hoped that the average

weekly wage calculated for the quarter would be sufficiently representative of the worker's "economic value" to justify comparisons between one period and another. Comparisons between wages in different workshops could not, of course, be attempted for even if the wage recorded could be taken strictly to represent "real earnings" - which, in some cases seems doubtful - the conditions and methods of payment vary from one place to another. But within each workshop it has been possible to show how the various classes of blind persons differ in earning capacity and also sometimes (when ratings were available) in quality of work. These comparisons are given in full in the next section where the influence of age, experience, and residual vision are separately considered. Further, when values for the quality of work have been obtained these have been studied in the same way.

(b). Study of dexterity by means of tests. The tests used were those already described in the earlier report. They were:

(i) A peg-placing test in which pegs are placed in holes in a board.
(ii) A similar peg-placing test in which the thumb and the other fingers of the preferred hand are used independently in turn.
(iii) A test in which nuts are threaded on small bolts (both hands).
(iv) A test of screw-twisting in which wrist movements are dominant.

The tests were given to each worker individually and in private under constant experimental conditions. Consequently, in these studies, direct comparisons may be drawn between workers of all kinds irrespective of their trade or workshop. It is however important to discover whether special training, such as for mat-making, basket making etc. shows any effects and so comparisons have been made between workers grouped under trades. The collective results are given in the next section, but those for each separate workshop are dealt with in greater detail in

subsequent sections of the report. In all the tests were given to 181 men and 96 women; in 33 cases the tests were given twice to the same workers in order to obtain a measure of the reliability of the tests.

2. Results.

i. Study of Wages.

(a) Average weekly wages earned. In Table I the average weekly wage (calculated over a quarterly period) for each trade, for men and women separately, is shown for each of three main age groups. It was desired to obtain figures which would show changes with age and experience, so the age groups were chosen to include respectively, those during the early years of full time work (20-29), those who might be expected to be at the height of efficiency (30-39) and those whose earnings might be affected by a "slowing down" (40 and over).

The classification into "totally" and "partially" blind used in Table I was based chiefly upon simple tests carried out by the investigator. In the case of the Barclay workshops an oculist's report was available from which a highly precise ranking for vision was obtained. The classification given by the Institute's tests was however in such exact agreement with that of the oculist that in subsequent studies the former was deemed sufficient for the practical purposes of the enquiry. Hence the "partially blind " are those who can distinguish shapes and colours, detect the difference in the length of two black lines (on white paper), and name objects in a picture of an easily recognisable scene. They include all who possess over $\frac{2}{60}$ on the oculist's rating. The "totally blind" include those whose "vision" is limited to distinction of light and dark (with or without the ability to name the primary colours) and whose recognition of objects is uncertain even when they are large.

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Table I may be used in several ways. The last column gives the differences between the average weekly wage earned in 1928 by the partially blind group and by the remainder respectively. In interpreting these differences reference must be made, of course, to the average experience of those who constitute the groups, but this is complicated by the fact that the effects of experience can only be guessed at. It is reasonable to assume that increase in experience brings with it an increase in skill and therefore in earning capacity, but these increments do not go on indefinitely. Probably after a period of more or less constant capacity the influence of increasing age will show itself in a reduction in output. At what age, in the cas of the blind and the partially blind, are we to expect this effect to show itself.

The figures under the heading "wages last quarter" (Table I) suggest that in almost all the workshops the maximum earning capacit tends to fall for the larger groups at any rate within the years 30 to 40. This seems to hold for men and women and for partially and totally blind alike, but the effect may be obscured by differences in experience within each age group. Since the age at which the person becomes blind varies greatly the average experience of the age-groups given does not always increase proportionately. Thus among the partially blind basket makers the average experience (9 years) of the four who are over 40 is only equal to that of the seven who are between 30 and 40. These seven again have not had the experience one would expect them to have had if they had completed their training at about the age of 20. So that, if experience counts for much the average earnings both of the four (28/6) and of the seven (29/8) are lower than they might have been. But on the whole the variations in earnings are not large and one may question whether long experience (once the trade is <u>learnt</u>) makes much difference. The numbers in the sub.

groups however do not justify anything more than the statement that there is a constant tendency in the direction indicated above. A re-arrangement of the data according to length of experience does not help greatly since the groups are then unequal in average age, and there are too few cases to allow of sub-division into groups equal in both age and experience. But Table II, which shows the changes in the earnings of the groups during the period under review, also shows a general tendency for earning capacity to increase during a period of ten or eleven years and thereafter to decrease. It will be observed (Table II) that the average experience of those whose earnings have decreased in only one case falls below 10 years.

Much larger differences are seen, however, when the earnings of the partially blind and totally blind are compared. These differences are given in the last column of Table I. Allowing for the possible effects of experience (increasing efficiency up to 39 and decreasing it afterwards) there are consistently large differences between the average earnings of the two groups. Where the differences are not large, as for example, where the eighteen partially blind basket makers only earn on the average 26/4, sevenpence more than the seven totally blind basket makers, (25/9), the length of experience is a factor. In this case the latter have the gains of three extra years of experience. Where, however, two partially blind brush makers (women; average experience 6½years) earn on the average 5/7 less than three totally blind brush makers of the same age (20-29) and experience (7 years) we seem to have an instance where the efficiency of the totally blind exceeds that of the partially blind. But when the number of cases is so few individual differences produce greater effect and we may have here three good members of the totally blind class compared with two particularly poor members of the partially blind group.

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This illustrates the weakness of the figures in Table I and II. If the numbers in each group were larger we could not only sub-divide further to bring out more clearly the differences of experience and age, but we could be more certain that the averages are uninfluenced by the accident of selection. Nor can the difficulty be easily overcome by including wages records from other workshops, since these are not directly comparable. The number of employees in each department of a workshop seldom exceeds 24 and when these are classified according to vision the numbers to be compared are inevitably small. All we can do by adding similar studies from other workshops is to show whether the tendencies disclosed in these tables are <u>invariably</u> confirmed. It will, however, be worth while to do this as opportunity arises during future investigations.

In the meantime as regards the relative efficiency of the partially blind and the totally blind as shown by the wages records the indiciations are substantially in favour of the former. Although the effects of age and experience are not wholly excluded in the classification of Table I the general trend of the differences in earnings is unmistakable. A composite figure for the average earnings of the partially blind workers as compared with those of the totally blind workers would be misleading unless the average experience of each group were substantially the same and the numbers approximately equal. Actually the figures are:-

(i) Men (baskets, mats and brushes)
Partially blind, number 70, average age 29.6 years, average experience, 7 years, average weekly wage 30/7.

Totally blind, number 82, average age 28.8 years, average experience 13 years, average weekly wage 25/11.

(ii) Women (weaving, brushes)
Partially blind, number 17, average age 30 years, average experience 9 years, average weekly wage 23/-.

Totally blind, number 24, average age 33 years, average experience 10 years, average weekly wage 21/-.
Percentage difference 9%.

Unless we know the exact effect of the differences in age and experience in the case of men it is impossible to say whether the percentage difference in earnings (18) is more or less than it would be if men of equal age and experience were compared. The difference in average age of the two groups is larger even than the difference in experience and consequently in view of the effects of age already discussed the lower earnings of the totally blind group may be partly due to that fact. In the case of women however the differences in age and experience are not large and the totally blind are still well within the limits (supposed) of maximal efficiency. Hence on the whole we may suggest that 10 per cent. represents the average difference in earning capacity between totally and partially blind in the trades at present carried on in the workshops for the blind.

In this connection it is worth while to report the result of a visit to Messrs. Cadbury's during which the work of a team of blind girls was carefully studied. All the four girls possessed some residual vision, one being a myope. Their efficiency relative to the average factory worker is shown in the following figures supplied by Miss Cadbury who was personally responsible for the arrangements made in connection with their wor

(i) When the team is made up of 2 normal sighted and 5 blind girls output of team is 84 per cent. of normal sighted teams. Increase in cost is approximately 2 per cent. (girls' wages only).

(ii) When the team is made up of 3 normal sighted and 4 blind girls output of team is 91 per cent. of normal sighted team. Increase in cost is approximately 1 per cent. (Girls' wages only).

"The Blind girls earn the same amount in wages as the normal sighted teams. This is due to the fact that they only work on what may be termed the lighter and better paid packings. They also receive more assistance from the men." (Miss Cadbury's report).

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We were told also that the normal sighted girls in the mixed team are paid slightly more than the average because they have more work to do to maintain the maximum output of the team.

In other words the burden of maintaining the efficiency of the team falls upon the sighted members of it. During our own observations of the girls at work it was apparent that the steady flow of packed cartons depended greatly upon the watchful eyes of the two leaders of the team. An extra prepared carton slipped in here, a set of labelled tins taken out there, or an extra package tied up later on undoubtedly made a big difference, not only in keeping the flow of work constant, but in removing any feeling of strain which might arise from the realisation of the blind worker that the work was "piling up" against her.

This kind of help being necessary when the girls are able to see a little, we must imagine its amount increased when the workers are totally blind. It is true that the processes being performed at Messrs. Cadbury's are simple and apparently well within the capacity of a totally blind person; but the vital point is speed of movement, and one may reasonably doubt whether the totally blind can, on the average, attain the speed of movement which is necessary. But on this point more will be said when the results of the tests of dexterity have been considered in the next section.

(b) Quality of Work. There is, however, the further question of quality of work. Records or estimates of quality of work were not available in all workshops. Detailed studies of those which were obtained are given in dealing with the workshops separately.

On the whole there is little evidence to justify the belief that the totally blind, although slower than the partially blind, are superior to the latter in accuracy and quality of work. On the contrary there is a strong suggestion

that in weaving and in brush making the partially blind are superior, though in mat making there appears to be little or no difference.

Possibly one explanation of the contradictory views already mentioned lies in the differences which exist between the nature of the work required in different trades. Some of these differences seem to be expressed in the results here reported. In the making of mats, for instance, quality appears to depend largely on "tightness". This being the case, there seems no reason why the partially and totally blind should not be equally good. In brush making, on the other hand, as also in weaving, it seems possible that mistakes are more easily avoided (or detected when made) by the partially blind than by the totally blind and this may eventually determine the quality of the work as well as the amount produced. Be that as it may, there is no evidence that, in general, some compensatory power of "concentration" enables the totally blind to excel (or even always to equal) in quality the work of the partially blind.

ii. Study of results of tests of dexterity. The results obtained from the use of tests of dexterity are shown in Tables III and IV where the average scores in each test (lowest scores being best) for each age group in each trade are shown.

(a) Influence of age. This is seen in Table III for each trade separately; Table IV gives the massed results. The differences in average score between the age groups vary from test to test. In straightforward pegging and in the assembly of nuts and bolts there is a definite reduction in speed with increase in age. In the screw twisting test, however, with the exception of the older totally blind there are no marked differences in score between one group and another.

(b) Influence of vision. The differences between the partially blind and the totally blind are similarly very marked in the pegboard and nuts and bolts tests, but not in the screw

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twisting tests.

(c) Influence of trade. In making comparisons between one trade group and another it is necessary to assume that the groups are unselected. This is probably not the case since it often happens in practice that those who are placed in the less remunerative trades, such as brush and mat making are those who are not considered capable of success in weaving, basket making or machine knitting. But it is impossible to allow for this factor in the data before us and consequently the differences disclosed must not be given too much significance.

Bearing this in mind, and comparing the partially blind and the totally blind among themselves in the different tests the following conclusions may be drawn.

Men (Partially Blind)

Test I.

The brush makers and the mat makers are, as a group, not so dexterous in peg placing as are the workers in other trades but the differences are not large.

Test II.

There are no marked differences between the groups, though the brush makers are not generally so good as the others.

Test III.

The very best group here is the boot repairing group at Swiss Cottage who show a marked superiority in speed of manipulation over other trades (including the other two trades carried on at Swiss Cottage). The differences between the other groups are not large with the exception of the mat makers who, in spite of the fact that many of them are still young, show that their capacity to perform the comparatively delicate movements of this test is not high. The results from the Boot repairers are rather striking and further reference will be made to them later.

Test IV.

The best group is again the boot repairing group and the

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worst is the mat making group, but while the superiority of the former is not very much (whether reckoned against the other partially blind groups or against some of the totally blind groups by whom they are excelled) the very poor success of the mat makers is outstanding. Here again we seem to encounter effects with which training may have something to do.

Men (Totally Blind)

Test I.

In this test the chair-caners, boot repairers and basket makers come out better than the brush and mat makers to an even more marked extent than in the case of the partially blind. It will also be observed that the best of the totally blind groups is only equal to the worst of the partially blind groups.

Test II.

The results in this test are similar to those in Test I the same differences between partially and totally blind being disclosed.

Test III.

As was the case for the partially blind, the boot repairers show a remarkable proficiency in this test, surpassing that of all other groups except their own companions. It is difficult to decide which is the next best group since the excellence of one group of basket makers is counterbalanced by the poorness of the other. On the whole the differences between the totally blind mat makers, basket makers and brush makers are slight.

Test IV.

The most interesting feature of this test is the success of all the totally blind groups at Swiss Cottage; it suggests that these are highly selected groups composed of workers who have developed a high degree of manual dexterity. It is difficult to decide whether training has been a partial factor but it is a possibility which should not be overlooked.

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Women (partially and Totally Blind)

The numbers in the groups, other than the weavers, do not justify any special remarks.

Comparisons with the seeing.

One other comparison remains, viz. that with the achievements, in tests of the same kind, of persons who can see. The results are shown in Table V. The persons were asked to perform the tests twice, once under normal conditions, the second time with eyes closed.

The differences between the groups must be interpreted in terms of the mean scores. (Percentage differences have not been calculated since the units are not equivalent throughout the scale). It will be observed that in peg placing the blind do better than the seeing with eyes closed, but this is not the case in the nuts and bolts test. The adults included in the two age groups were highly selected for intelligence but presumably were unselected for manual dexterity. The results are given as a means of judging the order of differences between the blind and the seeing in repetitive work. Even if we regard the figures for the seeing as above the average there are still large differences in effective skill between blind & seeing. Nor are these removed altogether when the seeing subjects are blindfolded. This opens up a number of questions which cannot be discussed here.

iii. Conclusions and Recommendations. The facts emerging from this investigation are now fairly clear and there only remains to consider their practical consequences. The most reasonable interpretation to take of the results here reported is that the potential efficiency for occupations of a manual kind of the blind or blinded person near the 'border line' of certification ($6\frac{6}{0}$) is not generally reduced as much as the

potential efficiency of those whose blindness approaches more closely to totality. Whether vision is itself the direct cause of these differences or whether the effects are indirectly produced by a different "habit of life" which the higher degrees of partial vision may permit, it is difficult to decide. Judged by the tests applied, the majority of those whose visual acuity lies between $\frac{2}{60}$ and $\frac{6}{60}$ are able not only to see to find their way about with ease but also to identify the shapes of objects and to locate their positions. In some processes such as the placing of pegs in holes and the forming of telephone bell-sets (wires of various colours being used) it is conceivable that vision is a direct aid. It may be recalled that the most successful bell-set maker at Swiss Cottage was a girl whose vision was of the "borderline" character (cf. previous report). On the other hand in placing nuts on bolts, although speed in locating the position of the separate nuts and bolts is a factor, it seems possible to achieve considerable success independently of vision (cf. the totally blind boot repairers). In this case, however, the training in picking up the brads and placing them in position for driving which the boot repairers have received may account, in part, for their superiority relative to other groups of totally blind workers.

It has already been pointed out that the differences in earning capacity between the partially blind and the totally blind are not very large (about 10 per cent.), but the differences in the tests (except the screw twisting test) are much larger (Table IV). This may be explained by the fact that the occupations at present carried on in the workshops for the blind were chosen because of their suitability for the totally (as well as the partially) blind. In basket and mat making the proportion of time required for movements and manipulations in which vision helps greatly is not very large. Consequently, (just as in the screw twisting test

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where vision cannot help,) one may expect the more competent of the totally blind to equal, if not to exceed, the average of the partially blind - which they frequently do - while their general average should fall very little behind. The significance of the differences discovered between the earning capacity of the two groups lies chiefly in the fact that in occupations which actually favour the acquisition of reasonably high skill and efficiency by the totally blind they have not succeeded in holding their own. Hence we can only conclude that if they are placed in occupations which are less suitable their efficiency will be correspondingly lower.

This brings us to the practical problem we are called upon to solve. The search for new employments for the blind in factories must be controlled by the knowledge that efficiency sufficient to satisfy the employer can only be guaranteed under special conditions, i.e. under conditions where the relations between the potential capacity of the worker (depending upon his age, experience and degree of vision) and the demands of the work are thoroughly understood. The position at Messrs. Cadbury's factory illustrated admirably the way in which the problem should be approached. A satisfactory degree of efficiency has been reached there through two factors:

(a) the employment of partially blind girls (one is a myope)

(b) the "dilution" of blind girls with sighted labour. It will have been noted that the most efficient combination is one in which there are only four blind workers in a team of seven.

Our investigations suggest that these two factors are not accidental. We do not know whether totally blind girls have been tried at Bourneville and have proved failures, but the similarity between the data provided by our analyses and the successful use of partially blind workers in this factory is highly suggestive.

Hence the practical suggestions which these studies

prompt us to make are as follows:

(i) To encourage the partially blind (especially those near the border line) and perhaps those totally blind who have had factory experience, to consider employment under factory conditions, and to reserve the present occupations mainly for the totally blind.

The chief objections likely to be raised against this suggestion are

(a) a possible tendency to reduce the efficiency of workshops below their present level, when the chief need is to raise it.

(b) discrimination of opportunity between one group and another; the blind workshop may be considered the more attractive alternative.

(c) comparative smallness of earnings possible in ordinary factory employment.

The answers to these objections are, we think,

(a) improvement in existing workshops could be secured by better organisation in spite of limiting employment mainly to the totally blind. In any case the difference in efficiency in the occupations at present followed is not large.

(b) the differentiation could only be brought about gradually and preferably on a voluntary basis; it could not be compulsory. There would always be some partially blind workers temperamentally (and perhaps otherwise) unfitted for factory employment and these would have to be dealt with in the same way as at present. But if the desire for independence is a real factor in the life of the blind it might be successfully appealed to by the suggestion that in factory employment there lies the prospect of equality (or nearly equality) with other people. At the same time we must be certain that this is a fact.

(c) the question of earnings is an important one which cannot be ignored. So far, it is true, the processes discovered in factories on which the blind might be employed are of the repetitive type which are comparatively poorly paid. But the study of the <u>average</u> wage earned in most of the workshops for the blind suggests that if factory work can be found at which from twenty to thirty shillings may be earned it would be well worth while to undertake it. At present we have not enough information as to the wages it is possible to earn in factory work, because we have not sufficiently explored the ways and means of employment. Moreover, we have, so far, considered only the possibility of <u>individual</u> employment; if 'team work' were general, earnings might be raised considerably.

(ii) To use the 'team' method - combining blind and seeing workers - to its fullest possible extent.

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The influence of the aims of earlier generations of supervisors of blind welfare (viz. to give each blind worker the fullest sence of independence and success) is seen in the existing institutions where work is individual and supervision and assistance is general. In other words the amount of help and correction needed to produce saleable goods in their finished form is distributed over the whole workshop. It is usually also kept at a minimum; that it to say, making one or two notable exceptions, there is no attempt made to increase the effective output of the workshop by bringing in seeing workers who, by increasing the averag output per worker, would thenreduce the total cost of the articles produced. There are several reasons for this, apart from the very natural view that the workshops only exist to provide employment for blind persons; the occupations now carried on do not require a high percentage of supervision, they are largely individu and there is only a limited demand for the articles manufactured. Hence, the adoption of different methods of organisation might be difficult to bring about, although under changing conditions even methods which have stood the test of time may be found inadequate.

But if, as it seems is the case, the markets for mats, baskets, and similar goods are steadily diminishing and if new ways of utilising the same materials and workmen within the same trade cannot be devised there is, as was pointed out in the last report, a strong case for the introduction of entirely new methods of dealing with the employment problem. However, up to the resent, it has been difficult to decide which among several alternatives are likely to prove the most suitable. Sub-contracting, work in ordinary factories, and development of new industries are some of th ways in which progress can be made. Each has its obvious advantage and disadvantages, but in the light of the results of this investigation it is now possible to estimate more exactly what their relative merits actually are.

Accepting the principle that the blind workman is handicapped to more or less extent in all work in which vision is normally a help, and that the larger the visual factor in efficiency the greater is the handicap, we must endeavour to raise the efficiency of the blind workman, not by attempting to equip him for impossible tasks but by carefully selecting the work each man is asked to do. In general, we can add to his capacity chiefly

(a) by giving him work as free from difficulties due to lack of vision as possible, or

(b) by removing these difficulties from the work by appropriate methods of organisation.

The improvement to be secured by training seems clearly to be conditioned by these two processes. The former includes the majority of the existing methods; the latter probably indicates the best line of progress for the future.

Difficulties may be removed by means of

(a) special apparatus and the adaptation of machinery (as has been done in the case of the trades already taken up and by Herr Perls and others in the case of factory employment).

(b) appropriate organisation.

We have come to the conclusion that one of the most promising forms of organisation for efficient work is one in which a number of blind workers form a 'team' with a number of seeing workers, their combined work covering the completion of one unit of production. ('Team' is not used here in the sense of an aggregate of separate units working in one room or department). This seems to offer a means of considerably reducing those difficulties which the blind worker as a single unit could not easily overcome. We do not consider that the work of packing cocoa tins carried on at Messrs. Cadbury's is unique in character and it is probable that a similar method

of organising blind labour could be successfully applied to processes in other factories.

It might also be successfully applied in existing workshops for the blind. The introduction of new trades into existing workshops seems inevitably to mean the introduction of work requiring a higher proportion of seeing workers than is at present the case. Hence a practical line of development would be to consider occupations which might be run on factory lines, employing a considerable proportion of seeing workers but offering better opportunities to the blind to become efficient.

The problem of blind employment has not yet, so far as we are aware, been approached from this angle in more than a tentative manner. The search for new occupations has been directed principally towards processes which the blind might carry on individually and unaided without any guarantee that their efficiency under such circumstances would be sufficient to satisfy the employer. This search should now, we suggest, be continued along different lines; it should be directed towards discovering processes which the blind can perform as members of a team, their difficulties being removed by methods devised specially for the purpose, and utilising the seeing members of the team to the best advantage. Something on these lines was done at Swiss Cottage during the bell set forming experiment.

It is in this connection that an experimental workshop and training school should prove of most value. It should enable processes, to which this method is applicable, to be studied under experimental conditions so that their extensive application wherever opportunities for the employment of blind persons are discovered can be made without misgiving.

But ultimately the choice both of the factory process and of the persons to be employed upon it must be carefully relate

to the potential efficiency of the latter. The relative capacities of teams composed wholly of totally blind workers, partially blind workers, or of a mixture of the two may now be fairly accurately estimated, and the importance of fitting the men to the job was never more clearly exhibited than it is in this connection.

In conclusion we desire to express the view that there is nothing in the results here reported or in the recommendati based upon them to warrant any diminution of optimism concerning the future development of the employments of the blind. "Victory over blindness", remains a practicable ideal; our enquiries merely emphasise the need for discrimination. If the shelves in the larder are at different heights, we must allocate the highest shelves to the tallest people, - for while we may equip the shortest with foot-stools we can never make them quite equal to the others when speed is required. The joy of conquest comes when the tasks we have to face call forth all our powers but do not lie beyond the limits of our capacity. To give the blind of the present and of the future the feeling of victory in their occupational life remains possible even though much of the work found for them to do may be of the simplest kind. We are inclined to believe that in spite of the strong individualistic tendencies characteristic of older blind people, and a certain proneness to suspicion, co-operation in team work could often be secured under appropriate conditions, and that the resultant benefits would have far-reaching results.

II. THE VOCATIONAL PROBLEMS OF THE MORE HIGHLY EDUCATED BLIND.

1. The Problem.

One of the more pressing needs, we understand is that of finding employment for those who have received a higher education, consequently during the latter part of the investigation special attention has been given to these problems. Those more particular

considered were the problems connected with the employment of young people who have received some higher education of a general character (as at Worcester and Chorley Wood) or of a vocational nature (as at Norwood). The allied problems of the re-education and employment of highly educated and highly trained adults we have excluded for the present as differing greatly from case to case.

In considering the vocational problems of younger blind people it is well to remember the circumstances under which the institutions for the higher education of the blind came into being. They began partly as places where the children of well-to-do parents could be given the tools of learning and the means of acquiring the culture which their social position made desirable. In such cases there was seldom any idea of training for a specific vocation. Concurrently there developed however a stronger realisation of the wastage which occurs when a boy or girl of high intelligence but no capacity for manual labour is compelled, through force of circumstances, to become apprenticed to a trade. Formerly in such cases advanced instruction was given in the ordinary institutions wherever the conditions would permit, but the practice now is to send all boys and girls of promise to one or other of the schools where advanced studies are carried on. Thus, the question of vocational training has begun to force itself upon the notice of these higher schools. At Worcester, for example, the son of wealthy parents no longer proceeds, as a matter of course, to complete his advanced school courses by leisurely studies at a University. Naturally he wishes to aim at a career, just as others of his school companions do from necessity. But it is by no means certain that a course of instruction which prepared for entrance to a University is the ideal for those whose wish is to enter some occupation directly they leave school. Mr. Brown and Miss Moon

have realised this but their principal difficulty arises from the fact that few of the instruments of culture which they are able to include in the curricula have any specific vocational bearing. Consequently they are often called upon to assist their pupils to some occupational choice feeling that the training the latter have received helps little in the solution of the problem. The following list illustrates in the case of girls, how limited the possibilities at present are:

Occupations pursued by old girls from Chorley Wood.

2. teaching
3. University courses (1 proposing journalism)
?. massage
1. kennel maid
2. handicrafts for sale
4. no career for health reasons
3. died

Plans of Senior girls now at Chorley Wood.

2. teaching
1. governess and care of children
1. piano
1. Norwegian learning English
1. social welfare (girls' club)
1. entertainer
2. no career fixed

In the case of boys the principal careers are already well known. From Worcester boys have successfully undertaken the duties of solicitor, clergyman and lecturer. From Norwood they have gone out mainly as teachers (including music) or piano tuners.

The number of leavers each year naturally varies a little but the average number is about

4 - 5 from Worcester
3 - 4 from Chorley Wood

3 teachers
10 - 12 tuners (boys) from
and 4 - 5 music (teaching and instrumental) Norwood
3 Typists (girls)

2. Enquiries.

We visited each of the Institutions above mentioned to

see something of the work being done and to obtain from the heads some indication of the magnitude of the problem and the attempts made toward its solution.

We learnt that the general practice at present is for some discussion of vocational plan to take place either at entrance (the older pupils) or at some convenient stage during the school course. In the case of Norwood, the decision is made immediately before the course of training is begun, but it may be reached a good deal earlier in the case of pupils in the junior school. The position may be summed up by saying that Norwood is essentially an institution in which specific vocational training is offered whereas Worcester and Chorley Wood give practically none. The principals of these latter institutions are not entirely opposed to direct vocational training but they feel, rightly, that, until it is clearly shown how their schools can prepare more directly for occupational life without loss of any of their aims, they must continue to work out their salvation as best they can along their present lines. The problem, therefore, is twofold:

(i) to discover, if possible, additional occupations in which blind persons of high intelligence and appropriate education can succeed

(ii) to adapt the processes of education and training accordingly.

It is not difficult to realise that a high intelligence is an endowment which should be allowed full scope for development. Life becomes full of interest to a person whose store of knowledge and powers of perception are adequate. Consequently there is everything to be said for giving blind persons who are sufficiently capable to profit from it an education of a largely intellectual character. But we cannot expect such an education suddenly to acquire vocational significance, and if we

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considered the vocational training to be the more necessary we must be prepared to sacrifice some of the advantages of the general education. It seems fairly clear - as a matter of experience - that the time taken by the blind to reach a given standard of proficiency, whether in school subjects or in occupations, is longer than that taken by those who can see. If then it is expected that the young person will become self-supporting within a reasonable period he can not spare much time for 'cultural' as opposed to 'bread and butter' studies. This is perfectly obvious at the elementary school levels where the intellectual interests and attainments of the workshop pupil are far from high. Thus, we seem to be asking for the more intelligent blind children either a considerably prolongation of student-life or the introduction of vocational training at a stage when their general education is by no means equal to the requirements of the vocation chosen.

Of these alternatives the former will generally be preferred but practical considerations may make it difficult to carry out in every case. Probably much will also depend upon the occupation chosen. This brings us to the problem of finding suitable occupations.

In dealing with this problem we have adopted two different lines of approach. In the first we compiled from handbooks of occupations and careers a list of those for which (a) secondary school education and (b) University education are essential or at least highly desirable. We then considered the practicability of employing blind persons in them. The elimination of occupations which are impossible, or only possible under really exceptional circumstances (such as dairy farming), left us with a list which is almost identical with the occupations already proposed or attempted. These are as follows :

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Music teaching
Elementary school and kindergarten teaching
Voice training and Elocution - Reciting
Interpretation and Translation
Massage
Typing and Shorthand
Journalism
Lecturing - University
Public speaking
Music - Broadcasting
(Poetry)
Care of animals (limited)
Business - correspondent, agent
Law - Solicitor, Legal adviser, etc.
Church
Commission agencies
Insurance - agency
Clerk - general assistant, enquiries, telephone calls, etc.
Telephone Switchboard operator.

The opportunities in some of these occupations are limited and there are difficulties of adjustment in some of them that require careful examination. There are other occupations mentioned (especially in American publications of occupations pursued by blind persons) but they seem to include cases in which the blinded man pursues the same career as he followed before he became blind. This, however, is not the problem we have to solve; the essential point is the possibility of new vocational training <u>after</u> blindness.

In excluding occupations such a chiropody, pharmacy, etc. we have been compelled to consider the normal conditions under which occupations are carried on. In most cases it is necessary for the individual to be adaptable, i.e. to be able to perform a variety of tasks directly or indirectly bearing upon his work. The higher the profession the less does it seem possible for a "division of labour" to be effectively arranged. Especially is this the case when the occupation in question requires some practical skill, and the occupations which require higher education are far from being exclusively 'intellectual' in character. In general we are forced to the conclusion that the majority of the opportunities for the employment of more highly trained blind persons lie in those occupations in which the methods adopted in gaining advanced instruction can also be employed.

Almost every blind person who has gained high qualifications has been dependent upon a 'reader' and it certainly looks as though this useful person will be a necessity throughout all his occupational activities. The only other way of overcoming the blind person's limitations is to apply the principles of 'team work' already described in Part I of this report. Our difficulty here is that the higher occupations do not lend themselves readily to this form of organisation. On the whole, it seems to us that the most likely direction for the discovery of opportunities on these lines is in business. The management of small shops such a newsagent and tobacconist, tea-rooms and catering, and the like seem to be possible on co-operative lines, but it is clear that the responsibili for 'smooth running' will fall largely on the members of the team who can see. In some of these cases artial vision will probably be found useful.

Our second line of approach has been to consider the requirements of occupations more generally in the way necessary in dealing with the vocational problems of seeing people. Starting from the psychological study of the individual in each of the three aspects - temperament and character, intellect and physique - we have considered how education, primary and secondary, secures the development of inborn aptitudes into general and special abilities of definite vocational significance. In considering the relation of these abilities to the needs of the principal vocations - church, teaching, administration, politics, law, journalism, commerce, industrial undertakings, engineering, art, music, etc. we have considered how special training is gained and how it bears on the problem of choice. Approached from this angle the vocational problems of the more highly educated blind present peculiar difficulties. The line of development is, and must be, mainly intellectual. Skills based on physical aptitudes and practice are hard to acquire, while the social

qualities necessary in direct contacts with other people are not easily developed under the ordinary conditions of blindness. The consequence is that the range of possible occupations is limited in two important ways, for success in many occupations is due to combinations of social, intellectual and practical abilities and the lack of one or other of these components considerably reduces the individual's effectiveness. The results of our studies in this direction confirm the conclusions already described.

3. Recommendations.

To sum up, the possibilities of adequately educating and equipping a blind child for a career in the occupations of a higher kind are not likely to prove numerous outside those already attempted. Our principal suggestions are:

(i) To explore co-operative activities of a business type

(ii) to increase the openings in occupations already attempted.

The number of young people to be launched out on a career is at present, from the schools mentioned, from 18 to 20 each year (excluding piano tuners). An increase in the number of openings for shorthand typists would perhaps make it possible to direct others more appropriately into productive employment. At present the training in shorthand typing seems to be given principally to girls. We suggest that more boys might be trained in office work with a view to securing employment for them in some branch of business; correspondence, costing, business method would be needed if co-operative businesses were organised. It is in this connection that the question - when should this direct vocational training begin? - requires an snwer. Allowing three years for the training, it might commence at 17-18, but at 21 the earning capacity of the trainee can at best only equal that of seventeen year old secondary/school applicants. But this kind of drawback must

always occur if the general education is to continue long enough to leave permanent results.

But it will be realised, we hope, that this survey of the problem represents the best we have been able to do in the time and with the means at our disposal. It seems best to state the problem exactly as it appears when approached in this particular way. We recognise that other methods of study may bring to light other possible occupations but until we know more concerning the exact effects of blindness we cannot fix any definite line of limitation. Studies in the workshops have shown how the limitations of blindness may be more accurately investigated; similar studies in the problems of higher education might be even more fruitful.

III. SUGGESTIONS FOR FUTURE WORK.

The problems for future investigation which arise out of this report are

1. On the industrial side.

   The selection of suitable processes in which to train blind persons.

   The selection of suitable persons for training.

   The methods of training.

   The methods of organising blind labour in workshops and factories.

   The co-operation of employers in securing employment.

2. On the professional side.

   The study of the processes of education and the limitations of blindness (in preventing studies such as science and mechanics).

   The determination of the best vocational training and the methods of giving it.

   The finding of opportunities for employment.

3. General.

   The whole problem of vocational training and education as

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affected by blindness.

(SGD) C.S. MYERS.
Director.

10th October, 1928.

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REPORT - Continued.)

APPENDIX I.

FURTHER DETAILS OF INVESTIGATIONS AT WORKSHOPS.

1. Studies at the Barclay Workshops for Blind Women.

(a) Study of earning capacity.

(i) Effects of experience. As described in the report, records of wages earned by 38 hand-loom weavers were examined and the average weekly earnings (on piece work) per quarter were calculated. Notes were also made of the quality of work as shown week by week in the records.

Table VI shows the amount of difference in weekly earnings between the second quarter of the year 1925 and the last quarter of the year 1927. It should be remembered that the figures refer to the average wage earned during the quarter, i.e. they are not appreciably affected by abnormal conditions.

TABLE VI.

Changes in average earnings after the lapse of two and a half years.

	Increased earnings.			Decreased earnings.		
	Number	Average experience	Average increase	Number	Average Experience	Average amount decreas
Totally blind.	10	5½ years	4/7	9	10 years	1/4
Partially blind.	11	8 years	3/1	6	11 years	1/5

Earning capacity, is of course, influenced by conditions of employment but the persons compared in the above table may be regarded as having been subject to the same changes. Other influences on earning capacity are experience, age and ability. The figures in the above table suggest that the time when the gains due to experience disappear comes sooner than might be expected.

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(ii) The influence of age and experience upon earning capacity.

Table VII gives a comparison between the partially blind and the totally blind according to age.

Table VII.

Average weekly wages earned by each age group.

Age Group	Partially Blind: No.of cases	Average experience	Wage last quarter	Wage over 2½ yrs.	Totally Blind: No.of cases	Average experience	Wage last qtr.	Wage over 2½ years.
20-29	6	5	23/10	22/7	9	5	22/4	21/11
30-39	6	11	29/3	27/1	4	11	23/5	23/9
40 -	1	17	28/4	27/5	4	12½	24/4	24/11

It will be observed that the period of maximum efficiency is reached after some years of experience.

(iii) The influence of age and experience upon quality of work.

Table VIII gives a comparison between the partially blind and the totally blind (arranged according to age) in respect of work.

Table VIII.

Relation between age and experience and quality of work.

Age group	Partially Blind: No.of cases.	Average experience in yrs	Per'tge. of A grade work last qtr.	Per'tge. of A grade work over 2½ yrs.	Totally Blind: No. of cases	Average experience in yrs	Percentage of A grade work last qtr.	Percentage of A grade work over 2½ yrs.
20-29	6	5	65	41	9	5	49	40
30-39	6	11	60	64	4	11	51	55
40-	1	17	100	87	2	10	53	57

Comparing the two classes of blind persons in this table it is difficult to see how the totally blind group (age for age) can be considered as equally efficient, even in regard to quality of work alone, as the partially blind group, at any rate in weaving.

The correlation coefficients between quality of work

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and the other factors for the whole group of weavers are as follows:

	Wage	Proportion of A grade work.	Proportion of A and B grade work.
Average weekly wage	x	r = .52 ± .08	r = .30 ± .099
No. of years' experience	r = .28 .10	r = .55 ± .076	r = .21 ± .108

Taking the groups spearately the correlations are:

Totally blind (11 cases excluding border line vision)

correlation between age and percentage A grade work .12

" " experience " " " " .00

Partially blind (13 cases)

correlation between age and percentage A grade work .70

" " experience " " " " .59

These results suggest that, within the older groups, age and experience have little connection with quality of work for the totally blind, though there is some relation between them in the case of the partially blind. This may mean that the totally blind reach their maximum efficiency sooner than the partially blind.

Effects of partial vision.

By separating the weavers into three groups according to vision, differences due to the factor of vision may be more easily discovered.

Earnings over a period of 2½ years.

		Last quarter 1927.
On the average, 14 totally blind average experience 7⅓ years earn	22/4	21/10
6 partially blind (lower grade) average experience 9½ years earn	23/10	23/9
17 partially blind average experience 8½ years earn	24/2	25/-

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Correlations with vision (oculist's report)

correlation between earnings and degree of vision

totally blind $r = .00$

partially blind (all grades) $r = .27$ .015

Partially blind (higher grade only) $r = .36$

Collecting together the coefficients for 13 partially blind (higher grades) we have:

Table IX.

	Age	Experience	Vision	Quality of work	Earnings
Age.	x	.80	.17	.70	.50
Experience.	.80	X	.22	.59	.39
Vision.	.17	.22	X	.00	.59
Quality of work	.70	.59	.00	x	.27
Earnings.	.50	.39	.59	.27	x

The correlation between earnings and vision for age constant is .58

while the correlation between earnings and age for vision constant is .50

In other words, if all these 13 weavers were of the same age, the correlation between earnings and vision would be .58, whereas if they were all of equal visual power the correlation between earnings and age would be .50, whence it is clear that both vision and age (or experience) affects the success of these 13 weavers. On the other hand the quality of work is influenced by experience but not by vision. This suggests that the influence of vision is to secure greater output and so to increase earnings.

The results have been arranged in Table X to show the comparative effects of age and degree of vision.

To obtain an indication of the reliability of the tests for persons of these abilities and experience the tests were given twice to each worker (33 cases). The results expressed as

correlation coefficients are as follows:

Pegboard Test I	r = .66 ± .055
Pegboard Test II (a)	r = .85 ± .018
Pegboard Test II (b)	r = .73 ± .046
Nuts and Bolts Test	r = .89 ± .018
Turnbuckle	r = .88 ± .018

All these coefficients (which show the degree to which the individual's success in the first trial is repeated in the second trial) are high for tests of this kind. Consequently the comparisons between groups may be regarded as reasonably reliable.

Table X.

Mean scores for each age group.

	Partially Blind					Totally Blind				
Age Group	No.of cases	Peg Board I.	Peg Board II	Nuts & Bolts	Turn-Buckle	No.of cases	Peg-Board I	Peg Board II.	Nuts & Bolts	Turn-Buckle.
20-29	7	142	129	6'2"	49	12	122	122	7'2"	45
30-39	3	131	124	7'57"	56	7	111	101	5'35"	42
40-	2	145	134	7'21"	47	2	115	80	6'11"	52

It will be observed that in the pegboard tests and in the nuts and bolts test the scores of the totally blind are generally not so good as those of the partially blind.

These differences may be expressed in another way by arranging the scores in order of merit and comparing the position of the members of the two groups. It appears from these order of merit lists that in

Pegboard Test I 19 out of the first 25 places are held by the partially blind.
9 out of the last 10 places are held by the totally blind.

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Pegboard Test I	19	out of the	first	25	places	are	held	by	the	partially blind
	9	" "	last	10	"	"	"	"	"	totally "
Pegboard Test II.	16	" "	first	25	"	"	"	"	"	partially "
	7	" "	last	10	"	"	"	"	"	totally "
Nuts and Bolts test	16	" "	first	25	"	"	"	"	"	partially "
	8	" "	last	10	"	"	"	"	"	totally "
Turn-buckle Test	15	" "	first	25	"	"	"	"	"	partially "
	5	" "	last	10	"	"	"	"	"	totally "

When all the tests are combined

19 out of the first 25 places are held by the partially blind

15 out of the last 16 " " " " " totally "

These results show that there are unmistakable differences in ability between the partially blind and the totally blind in these manual tasks. In some respects the differences seem to correspond to those already disclosed in regard to earnings. Superficially it would appear that success in the pegboard and nuts and bolts tests depends upon vision, those possessing a slight degree of visual power being at an advantage over those who lack this power. But the correlations between success in tests and the oculist's rating for vision do not consistently support this explanation, for although the partially blind are more successful than the totally blind in doing these tasks, those possessing the highest quality of vision are not always the most successful as compared with the rest of those who possess some residual vision. (The correlations in Table IX are not uniformly high).

This suggests that the true cause of these differences may be some factor which accompanies a certain measure of residual vision, that is some attribute which the partially blind possess and which the totally blind lack. If this attribute is not vision itself, then it may be a quality which the possession of vision tends to develop (or rather, perhaps, to prevent being lost). It is possible that it is a habit of quick movement which is showing itself here. Supposing that partially blind persons find

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it unnecessary to be ultra-cautious in their comings and goings they will tend to move more quickly and do things more quickly than the totally blind in whom a habit of deliberate movement may be more easily established.

Use of tests for prognosis of fitness for weaving.

The correlation between the tests and wages are shown in the following tables:

For the whole group of weavers (29 cases)

	Wages	
Pegboard Test I	r = .31 ± .11	.03 ±
Pegboard Test II	r = .31 ± .11	
Nuts and Bolts	r = .31 ± .11	
Turnbuckle Test	r = .52 ± .09	.18 ±.12
Composite of Pegboard and bolts Test	r = .45 ± .10	

Separating the larger groups into totally and partially blind sub-groups the correlations are:

Totally Blind.

	Wages	Age
Pegboard Test I	-. 33 ± .17	-.04 ± .19
" " II	.31 ± .19	-.06 ± .20
Nuts and Bolts	.17 ± .18	-.54 ± .14
Turnbuckle Test	.47 ± .15	-.19 ± .19

Partially Blind.

	Wages	Age	Vision.
Pegboard Test I	.55± .11	.28±.14	.40±.11
" " II	.49± .12	.57±.10	.53±.09
Nuts and Bolts	.45± .12	.21±.14	.06±.12
Turnbuckle Test	.45± .12	.01±.15	.05±.13

Remarks.

Success in weaving appears to depend primarily on three factors:

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(i) speed of movement.

(ii) quality of work.

(iii) temperamental factors such as perseverance.

The movements in hand-loom weaving are a flinging movement of the wrist and . foot movement. The latter is not tested by these tests and it is doubtful whether the former is measured to any extent by any of the tests used. Yet there are significant correlations between wages and many of the tests, especially in the case of the partially blind group, where all the correlations with wages are significant. This suggests that certain of the underlying qualities which make for success in the manual tests are also factors in success in weaving.

One other point perhaps deserves notice. In several instances while the tests were being given it was felt that the older workers were slower than the younger , and the investigator was tempted to think that age was an important factor in success, the younger workers presumably being more adaptable, and also, perhaps. more speedy in their movements, than the older ones. This estimate was not confirmed by the results of the tests except in the case of the nuts and bolts tests for the totally blind group only. A study of the table of mean scores shows that the "middle age" workers are better than the younger ones in some of the tests. The only correlations of the tests with age which are significant are found in the case of

(1) the nuts and bolts test (for totally blind workers).

Here the older workers are certainly slower.

and (2) the second pegboard test (for partially blind workers).

In this case the older workers are quicker.

This result indicates how the observer's general impression may be misleading and emphasises the value of appropriate analytic studies.

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II. STUDIES AT THE WORKSHOPS OF THE LONDON ASSOCIATION FOR THE BLIND AT BICKLEY.

For purposes of comparison with the results of similar enquiries at other workshops arrangements were made through the kindness of Captain Pollard to give tests of dexterity to the basket makers at the Bickley workshops. In all, 44 persons were examined, 12 of them being a group of "untrainables" (or very largely so called the "Ladder of Hope" group.)

In analysing the results, division into age groups is inadvisable on account of the small number of cases (excluding the Ladder of Hope" in each of the totally and partially blind classes. The comparisons shown are therefore for the main groups only.

It was found difficult to obtain records of earnings similar to those of the Barclay Workshops but three estimates of skill were obtained under the headings of speed, quality of work and independence, respectively.

The results are shown in the following tables:

Table XI.

Comparison of Test Scores of Totally and Partially Blind Basket Makers

Mean score for each group.

	Totally Blind.						Partially Blind.					
	No. of cases	Av. age	Peg-board I	Peg-board II	Nuts & bolts	Turn-buckle.	No. of cases	Av. age	Peg-board I	Peg-board II	Nuts & bolts	Turn-buckle.
Trained workers & pupils.	14	29	140	127	8'15"	49	8	26	120	87	6'44"	54
Ladder of Hope.	8	40	165	X	X	56	4	36	166	X	X	55

X Some of the "Ladder of Hope" cases were quite unable to do these tests.

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Comparison with the results obtained for weavers shows that the only large differences between the mean scores of the basket makers and the weavers for each main group are as follows:-

(1) nuts and bolts test in which the weavers excel, particularly the totally blind group.

(2) the second pegboard test in which the partially blind basket makers excel. It is curious that an effect which might be due to the nature of the work (since the manipulation of the basket materials calls for flexibility and independence of finger movement) should not be shown by totally and partially blind groups alike. Up to now, however, we have not been able to pursue this problem further.

Relation between the results of tests and the estimates of speed and of quality of work. Tables XII and XIII show these relations expressed as tables of correlation coefficients.

TABLE XII.

Partially Blind Group.

Correlation between scores in tests and	Speed	Quality of work	Age
Pegboard Test I	1.0	.56	.95
Pegboard Test II	.53±.17	.07	.52
Nuts and Bolts Test	.45±.21	0	.05
Turnbuckle Test	.43±.21	.18	.39

The perfect agreement obtained between Test I and estimates of speed is remarkable (although the number of cases is small)

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Table XIII.

Totally Blind Group.

Correlation between scores in tests and	Speed	Quality of work	Age.
Pegboard Test I	.48 ± .20	.40	-.15
" " II	-.13 ± .27	-.21	.50
Nuts and Bolts Test	-.15 ± .27	-.26	-.62
Turnbuckle Test	-.22 ± .25	-.40	.10

The above tables show that the qualities which make for speed of work in basket making are being shown in all the tests by the partially blind, but only in the first pegboard test by the totally blind. The results for the totally blind group show a peculiar reversal as compared with those of the weavers but the cause is obscure. It may be that since the pegboard test resembles the "setting up" of the basket work the practised blind basket makers do better at the test than the practised weavers.

The correlations with age suggest that the influence of age is more marked in the case of basket makers than in the case of the weavers, the older workers among the partially blind being the most successful in the tests. The condition is reversed in the case of the totally blind, especially in the nuts and bolts test, where the eldest are the slowest. It is possible that an increase in skill in basketry which comes from increased experience accounts for some of the positive correlations between the tests and age. No similar relation is shown however in the case of partially blind weavers, the only significant positive correlations with age occurring in the second pegboard test.

The weavers and the basket makers have however this much in common that, in the case of the totally blind group, there is a significant negative correlation with age in the nuts and bolts test. Here age appears definitely to be a disability, but whether it is a 'natural' slowing-up occasioned by age alone, or an effect induced by total blindness it is difficult to decide at present.

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III. STUDIES AT SWISS COTTAGE.

1. Study of Earning Capacity.

(i) Effects of experience. Since a considerable number of the workers joined after May 1926, reliable comparisons can only be obtained from 19 workers in baskets chairs and boots.

Table XIV shows the average earnings per week in the second quarters of the years 1926 and 1928 and the percentage increase or decrease effected. The figures refer to the average wages earned during the quarter and are therefore probably not appreciably affected by abnormal conditions.

The tables show the differences between the partially and totally blind workers.

Table XIV.

Changes in average weekly earnings after a lapse of two years.

	Increase			Decrease		
	No.	Increase	Percentage	No.	Decrease	Percentage
Partially	5	5/2	15	1	-/10	3
Totally	11	6/-	14	2	2/9	9⅓

The average experience for these workers was approximately 3.8 years, but on account of the small numbers available no conclusions can be drawn from these figures.

Table XV.

Average wages of partially and totally blind workers

	Number	Baskets	Number	Chairs	Number	Boots
Partially	2	33/5	8	31/7	8	36/11
Totally	8	36/4	4	38/3	6	36/4

It will be seen that except in the case of the boot

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makers the blind earn more than the partially blind. This result is partly due in the chair-making group to a totally blind man who earns 60/9 per week.

Correlations of Age and Wage.

1. Basket Makers (totally blind) + .38
2. Boot menders (totally blind) - .42
3. Boot menders (Partially blind)- .08

The figures for experience give only the number of years spent in the kind of work at Swiss Cottage. Considering them along with the number of years of blindness it is obvious that the experience must have been longer than is indicated by the figures. No correlation was therefore attempted between experience and wages or experience and the test results. In any case the numbers are too small for detailed analysis. Table XVI gives the relation between test results and wages.

Table XVI.

Use of tests for prognosis of occupational fitness.

	Test I	Test II	Test III	Test Iv	Composite
All Basket Makers 10	-.077	-.34	+.19	-.24	-.23
All Boot Menders 14.	+.49	+.45	+.27	+.35	+.64
Totally blind. Basketmakers 8	-.15	-.12	-.49	-.26	-.02
Totally Blind Boot menders 7	+.75	+.33	-.43	+.14	+.45
Partially blind Boot menders 7	+.53	+.29	+.86	+.60	+.86

It will be noticed that the only positive correlations of any magnitude occur with Bootmenders and that they are greater in the group of partially blind workers. (The nature of the work would suggest that a correlation might be expected between the earning capacity of bootmenders and some of the tests especially Test III).

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Table XVII gives an analysis of the order of skill when the results are arranged in an order of merit.

TABLE XVII.

Analysis of performances by partially and totally blinded workers in tests.

	(7	out	of	the	first	10	places	are	held	by the partially blind.
I	(9	"	"	"	last	12	"	"	"	" totally "
II	(3	"	"	"	first	10	"	"	"	" partially "
	(10	"	"	"	last	12	"	"	"	" totally "
III	(4	"	"	"	first	10	"	"	"	" partially "
	(9	"	"	"	last	12	"	"	"	" totally "
IV	(3	"	"	"	first	10	"	"	"	" partially "
	(6	"	"	"	last	12	"	"	"	" totally "
Com-	(4	"	"	"	first	10	"	"	"	" partially "
posite.	(10	"	"	"	last	12	"	"	"	" totally "

It will be seen there appears to be a marked superiority in the rank obtained by the partially blind over that of the totally blind, especially in Test 1

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IV. STUDIES AT WATERLOO ROAD.

1. Study of Earning Capacity.

(i) Change in earnings after one year.

Increase in earnings. Table XVIII.

	Number	Aver. Experience	Increase
Basket Makers	22	5¼ years	4/3
Basket makers	12	11½ years	2/1

Decrease in earnings.

	Number	Aver. Experience	Increase
Basket Makers	6	6 1/6 years	2/4
Basket Makers	6	24 1/6 years	-/10

It will be seen that far more workers obtained an increase in wages after the year than a decrease, but the larger increases occur, as one would expect, with the younger workers.

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Influence of Age on Earning Capacity.

Table XIX.

Partially Blind.

Work	Age	Number	Aver. Experience	Wage 1928	Wage 1927
Mat Making	20-29	15	3½ years	23/11	30/11½
	30-39	1	16	37/10	46/7
	40 -	4	6	27/5½	36/9¼
	Average	-	-	25/8	33/0
Basket Making	20-29	18	3	26/3½	22/6½
	30-39	7	9	29/8	27/9½
	40 -	4	8¾	28/5½	29/3
	Average	-	-	27/4½	24/9½

Totally Blind.

Work	Age	Number	Aver. Experience	Wage 1928	Wage 1927
Mat Making	20-29	7	4½ years	18/1	21/9
	30-39	3	9⅔	20/6	31/5
	40 -	7	18¼	18/9	27/4
	Average	-	-	18/9¼	25/11
Basket Making	20-29	7	6	25/8½	23/8½
	30-39	4	11¼	21/2½	20/10
	40-	8	29	19/7½	19/4
	Average				

Correlations between Age, Experience and Wages.

Partially Blind — Table XX

Mats

	Age	Experience	Wage 1928
Age	-	+.62	+.50
Experience	+.62	-	+.65
Wage 1928	+.5	+.65	-

Baskets

	Age	Experience	Wage 1928
Age	-	.84	-.08
Experience	.84	-	.14
Wage	-.08	.14	-

Totally Blind

Mats

	Age	Experience	Wage 1928
Age	-	.61	.22
Experience	.61	-	.55
Wage 1928	.22	.55	-

Baskets

	Age	Experience	Wage 1928
Age	-	.84	-.19
Experience	.84	-	.01
Wage	-.19	.01	

As one would expect, the only high correlations are

those of age and experience. It is significant that the correlations between wages and experience are very much higher for mat makers than basket makers (.65 and.55 - .14 and.01) in both the partially and totally blind groups.

Correlations between Wages and Test Results.

Table XXI.

Test	Basket makers		Mat makers	
	Partially blind	Totally blind	partially blind	totally blind
I	.40	.27	.18	-.08
II	.51	-.09	.44	0.0
III	.36	.21	.09	-.07
IV	.31	-.51	.02	-.28
Composite	.51	.04	.21	-.05

It will be noticed that the correlations for the totally blind are considerably less in every case than for the partially blind.

There are differences here between the trade groups which, taken in conjuction with those obtained from other trade groups, suggest that there are definite relations between the tests and skill in the trades.

This opens up questions which really require further investigation before any definite conclusions can be framed.

Analysis of the ranking of partially and totally blind workers in the tests
Table XXII.

Baskets	I	The	partially	blind	occupy	24	out	of	the	first	31	places	The	totally	blind	occupy	13	out	of	the	last	20	places
	II	"	"	"	"	25	"	"	"	"	31	"	"	"	"	"	14	"	"	"	"	20	"
	III	"	"	"		25	"	"	"	"	31	"	"	"	"	"	14	"	"	"	"	20	"
	IV	"	"	"	"	20	"	"	"	"	31	"	"	"	"	"	10	"	"	"	"	20	"
	Composite		"	"	"	24	"	"	"	"	32	"	"	"	"	"	11	"	"	"	"	17	"
Mats	I	"	"	"	"	16	"	"	"	"	22	"	"	"	"	"	14	"	"	"	"	19	"
	II	"	"	"	"	13	"	"	"	"	21	"	"	"	"	"	13	"	"	"	"	19	"
	III	"	"	"	"	13	"	"	"	"	21	"	"	"	"	"	11	"	"	"	"	19	"
	IV.	"	"	"	"	15	"	"	"	"	12	"	"	"	"	"	11	"	"	"	"	19	"
	Composite		"	"	"	15	"	"	"	"	20	"	"	"	"	"	11	"	"	"	"	19	"

The superiority of the partially blind is very evident especially in Tests I, II and III. The Composite figure gives an indication of the extent of this superiority.

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V. STUDIES AT BIRMINGHAM.

1. Study of Earning Capacity.

Table XXIII

Increase in Earnings.

Trade	Dept.	Blindness	Number	Average Experience	Average Increase
Mat makers	Men	Partially blind	3	9.3	9/5
		Totally blind	15	16.9	4/2
	Women	Partially blind	2	11.0	3/1½
Brush makers	Men	Partially blind	9	9.5	2/5¾
		Totally blind	12	10.9	2/8¼
	Women	Partially blind	3	9.0	1/10½
		Totally blind	7	14.9	2/-

Decrease in Earnings.

Mat Makers	Men	Totally blind	2	12.0	7/9
		Partially blind	none	-	-
	Women	Partially & Totally	none	-	-
Brush makers	Men	Partially blind	5	14.2	1/9½
		Totally blind	8	13.0	2/4
	Women	Partially blind	1	10.0	-/3

National Institute of Industrial Psychology.

REPORT - (Continued.)

Influence of Age on Earning Capacity.

TABLE XXIV.

Partially Blind.

Trade	Dept.	Age	Number	Average Experience	Wage 1928	Wage 1926
Mat making	Men	20-29	none	-	-	-
		30-39	2	5½	42/6	55/-
		40 -	2	10	43/4½	35/3
		Average	-	-	43/-	41/10
	Women	20-29	1	-	15/6	13/-
		30-39	1	11	20/-	16/-
		40 -	none	-	-	-
		Average	-	-	17/8	14½
Brush making	Men	20-29	8	5⅞	31/1	30/10
		30-39	5	16⅘	49/6	48/-
		40 -	2	26½	22/6	23/-
		Average	-	-	36/1	35/3
	Women	20-29	2	6½	11/10½	11/-
		30-39	2	12	15/3½	18/-
		40 -	none	-	-	-
		Average	-	-	13/10	14/6

Totally Blind.

Trade	Dept.	Age	Number	Average Experience	Wage 1928	Wage 1926.
Mat making	Men	20-29	2	3½	25/8	27/-
		30-39	7	10	28/11	26/10
		40 -	9	21⅞	27/3	24/1
		Average		-	27/8	25/9
	Women	20-29	None	-	-	-
		30-39	None	-	-	-
		40 -	None	-	-	-
Brush making	Men	20-29	6	7⅚	24/2	24/8
		30-39	6	11⅘	27/2	24/6
		40 -	8	14⅝	27/6	27/4
		Average	-	-	26/5	25/9
	Women	20-29	3	7⅓	17/6	16/2
		30-39	2	19	14/9	[illegible]/7
		40 -	2	22	17/6	15/6
		Average	-	-	16/10	14/10
Typists	Women	20-29	1	11	-	-
		30-39	None	-	-	-
		40 -	None	-	-	-

National Institute of Industrial Psychology.

REPORT - (Continued.)

Table XXV

Relation between degree of vision and quality and reliability of work

Men		Quality				Reliability.			
		Partially Blind		Totally Blind		Partially Blind		Totally Blind	
Trade	Age	No.	Aver.%	No.	Aver.%	No.	Aver.%	No.	Aver. %
Brush making	20-29	8	84	6	84	8	84	6	92
	30-39	5	85	6	74	5	85	6	83
	40-	2	90	8	65	2	65	8	70
Mat making	20-29	-	-	2	10	-		2	100
	30-39	1	100	6	100	1	100	6	100
	40-	2	87½	9	87	2	85	9	87
Women									
Brush making	20-29	2	87½	3	91½	2	77½	3	81½
	30-39	2	95	2	75	2	95	2	75
	40-	-	-	2	67½	-	-	2	67½
Mat making	20-29	1	75	-	-	1	75	-	-
	30-39	1	100	-	-	1	100	-	-
	40-	-	-	-	-	-	-	-	-
Typists	20-29	2	70	1	90	2	67½	1	75

Analysis of the ranking of partially and totally blind workers in

Table XXVI

Mat makers	I	The	partially	blind	occupy	4	out of the first 6	places
		"	totally	"	"	14	" " " last 16	"
	II	"	partially	"	"	5	" " " first 8	"
		"	totally	"	"	13	" " " last 16	"
	III	"	partially	"	"	4	" " " first 8	"
		"	totally	"	"	13	" " " last 16	"
		"	partially	"	"	2	" " " first 6	"
	IV	"	totally	"	"	12	" " " last 16	"
		"	partially	"	"	6	" " " first 9	"
Composite Brush Makers Men		"	totally	"	"	13	" " " last 16	"
		"	partially	"	"	9	" " " first 11	"
		"	totally	"	"	10	" " " last 13	"
	II	"	partially	"	"	9	" " " first 11	"
		"	totally	"	"	10	" " " last 13	"
	III	"	partially	"	"	9	" " " first 13	"
		"	totally	"	"	9	" " " last 13	"
	IV	"	partially	"	"	9	" " " first 13	"
		"	totally	"	"	8	" " " last 13	"
		"	partially	"	"	11	" " " first 13	"
		"	totally	"	"	14	" " " last 15	"

The superiority of the partially blind workers especially in Tests I, II and III is very evident. The composite figure gives some indication of the extent of this superiority.

TABLE I.

Average weekly wages earned by each type.

	Age group.	No. of cases.	Average age.	Average experience	Wages last quarter.	Weekly duration time quarter studied	No. of cases.	Average age.	Average experience.	Wages last quarter.	Duration during time quarter studied	Difference between weekly wages of Col. 10 and Col. 5
		Partially blind					Totally blind					
Basket makers (men)	20-29	10	22.6	3 years	26/4	23/7	17	25.4	6 years	28/3	23/4	-/7
		1	21.0	-	24/11	-	12	23.5	-	26/6	-	2/6
	30-39	7	35.6	9	29/9	28/10	6	30.0	11	31/8	20/10	1/5
							5	30.3	-	32.9	-	
	40-	4	43.8	8	26/6	29/3	9	46.1	29	28/8	13/4	1/11
		1	44.0	-	31/11	-	5	44.5	-	27/-		3/3
Mat makers (men)	21-29	10	26.8	9½	23/11	21/-	17	23.5	10	26/1	21/7	1/8
							12	27.0	2½	28/4	27/	
	30-39	2	37.0	16	37/10	44/7	8	33.7	12	24/6	21/3	11/6
		8	34.6	3½	42/4	38/-	9	38.0	10	28/11	28/10	4½/7
	40-	4	47.2	6	27/6	36/10	17	49.6	23	28/7	18/4	2/8
		8	46.2	20	28/3	26/8	9	41.8	18	29/4	18/1	1/10
Chair bottomers (men)	20-29	5	28.1	4	30/3	30/4	4	25.3	5	29/1	21/10	1/2

	40-	-	-	-	-	-	2	54.5	28	17/8	14/1			
	30-39	6	34.6	8	25/10	22/7	3	35.1	9	22/4	21/11			
	20-29	6	24.2	11	19/3	17/1	4	33.8	11	25/1	23/8			
	40-	1	40.0	17	28/4	27/3	4	41.8	12	24/4	24/10			
	30-39	5	34.0	2.4	27/8	-	2	34.0	3	30/6				
	20-29	2	30.5	1.04	26/-	-	1	27.0	7	46/3	-			
	40-	1	48.0	8	36/10	-	4	42.25	8½	30/2	-			
	30-39	1	25.0	7.0	26/1	-	2	35.0	3	43/1	-			
	20-29	0	-	-	-	-	1	27.0	8	35/3	-			
	40-	1	44.0	7	27/1	-	1	34.0	7	29/8				

TABLE II

Changes in average weekly earnings.

	Increased Earnings			Decreased Earnings		
	No. of cases.	Average experience	Average Increase	No. of cases.	Average experience	Average decrease
Partially Blind						
Basket makers (men)	22	5¼ years	4/4 1 year	6	4 years	2/4
Mat makers (men)	3	9⅓ years	9/5 2 years	-	-	-
Cane makers (men)	9	9½ years	2/6 2 years	5	14 years	1/10
Mat makers (women)	2	11 years	3/2 2 years			-
Brush makers (women)	3	9 years	1/11 2 years	1	10 years	-/2
Weavers (women)	11	8 years	3/1 2½ years	6	11 years	1/7
Totally Blind						
Basket makers (men)	12	11½ years	2/1 1 year	6	24 years	1/10
Mat makers (men)	15	16¾ years	4/2 2 years	4	12 years	1/1
Cane makers (men)	13	11 years	2/8 2 years	6	13 years	1/5

TABLE III.

Comparison between mean scores for different trades.

Trade	Age	Test I.				Test II.				Test III.				Test IV.			
		Partially		Totally		Partially		Totally		Partially		Totally		Partially		Totally	
		No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.
[illegible]	20 - 29	15	106.3	7	113	15	89.6	7	103	15	400.3	7	369.4	15	64.2	7	[illegible]
	30 - 39	2	104	4	136.3	2	77.5	4	117.3	2	292.5	4	485.8	2	51.6	4	[illegible]
	40 -	4	137.3	8	155.6	4	84.3	8	135.6	4	405	8	486	4	[illegible]	8	[illegible]
	Mean	(21)	112	(19)	136	(21)	87	(19)	120	(21)	391	(19)	444	(21)	64	(19)	65
[illegible] (Birmingham)	20 - 29	-	-	2	148.5	-	-	2	119	-	-	2	354.5			2	[illegible]
	30 - 39	3	91.7	7	169.4	3	81.3	7	134.4	3	413.7	7	483.5	3	39.3	7	[illegible]
	40 -	2	127	9	186.2	2	85.5	9	134.4	2	304	9	529.1	2	36.5	9	[illegible]
	Mean	(5)	106	(18)	175	(5)	83	(18)	133	(5)	370	(18)	492	(5)	50	(18)	50
[illegible]	20 - 29	19	100.8	8	119.5	19	81	8	98.4	19	405.7	8	410	19	42	8	[illegible]
[illegible]	30 - 39	4	112	4	142	4	89.6	4	127.2	4	407.2	4	555.4	4	39.2	4	[illegible]

	30 - 39	4	112	4	143	8	89.6	4	107.2	8	408.3	4	382.4	8	43.3	4	41
	40 -	4	125.5	8	143.1	4	79.8	8	131.2	5	420	8	600.4	8	57.8	5	41
	Mean	(31)	107	(20)	134	(31)	79	(20)	110	(31)	357	(20)	488	(20)	44	(20)	37
Medical Students (Hall Cottages)	20 - 29	1	100.5	2	138.8	1	87	2	109	1	380.8	2	470	1	43.7	2	38.4
	30 - 39	-	-	3	114.4	-	-	3	118.8	-	-	3	315.7	-	-	3	38
	40 -	1	106.3	3	134.4	1	63	3	83.7	1	357.5	3	376	1	38.6	3	38.3
	Mean	(2)	103	(8)	128	(2)	75	(8)	101	(2)	349	(8)	377	(2)	41	(8)	38
Grads Makers (Miscellaneous)	20 - 29	8	102.8	6	134.2	8	88.8	6	106	8	271.4	6	455.5	8	45.1	6	39.1
	30 - 39	5	131.4	6	127	5	96.4	6	118.9	5	401.2	6	385.7	5	51.3	6	37.4
	40 -	2	133.5	8	166.5	2	99	8	136.1	2	459	8	560.1	2	58.7	8	42.8
	Mean	(15)	116	(20)	145	(15)	93	(20)	122	(15)	338	(20)	476	(15)	49	(20)	38
Grads Makers (Hall Cottages)	20 - 29	1	123	2	120	1	89	2	85	1	379	2	339	1	44.5	2	42.5
	30 - 39	-	-	1	117.5	-	-	1	98.5	-	-	1	750	-	-	1	34.3
	40 -	1	94.5	2	111	1	75	2	92.5	1	364	2	317	1	39.5	2	38.4
	Mean	(2)	109	(5)	116	(2)	82	(5)	91	(2)	372	(5)	412	(2)	42	(5)	38

TABLE III (Contd.)

Comparison between mean scores for different trades.

Trade	Age	Test I				Test II.				Test III.				Test IV.			
		Partially		Totally		Partially		Totally		Partially		Totally		Partially		Totally	
		No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Scores	No. of Cases.	Mean Score
[illegible]	20 - 29	5	106.4	2	106.4	5	85.3	2	124.2	5	240	2	283	5	38.8	2	34.5
	30 - 39	2	120	1	120	2	86.5	1	79.5	2	310	1	384	2	26.8	1	28.5
	40 -	1	90.5	4	130.5	1	65	4	122.5	1	271	4	318	1	42.3	4	32.5
	Mean	(8)	108	(7)	122	(8)	83	(7)	117	(8)	261	(7)	317	(8)	38	(7)	30
[illegible]																	
Typists	20 - 29	2	84.5	1	115	2	66.5	1	75	2	363	1	345	2	57.5	1	44.5
Sewers	20 - 29	12	122	7	142	11	122	7	129	12	422	7	362	12	45	7	47
	30 - 39	7	111	3	131	7	101	3	124	7	335	3	477	7	42	3	36
	40 -	2	115	2	145	2	80	2	134	2	371	2	441	2	32	2	47
	Mean	(21)	118	(12)	139	(20)	110	(12)	129	(21)	341	(12)	404	(21)	45	(12)	42

TABLE IV.

Comparison between mean scores in tests for different ages.

	Age	Test I.				Test II.				Test III.				Test IV.			
		Partially		Totally		Partially		Totally		Partially		Totally		Partially		Totally	
		No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases.	Mean Score.	No. of Cases	Mean Score.
	20 - 29	10	114	11	136	15	109	11	114	16	398	11	413	15	48	11	60
	30 - 39	9	119.9	5	134.6	9	98.0	15	114	9	385	5	529	9	46	5	61
	40 -	2	115	6	148	6	90	4	122	2	371	4	494	2	58	4	64
	20 - 29	49	104	29	123	45	85	29	100	49	325	29	396	49	45	25	43
	30 - 39	20	119	26	140	20	88.0	25	122	20	536	26	663	20	49	26	50
	40 -	15	127	42	136	15	86	42	250	15	398	42	435	15	58	42	63

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

THIRD

REPORT OF INVESTIGATION (ABRIDGED)

FOR

The National Institute for the Blind,
224-6-8, Great Portland Street,
London, W. 1.

Since the last report to the Placement Sub-Committee in March, 1928, a further series of investigations have been carried out, the most important points being outlined below.

The Report has been divided into three sections:-

(1) Investigations into problems of Workshop environment.
(11) Vocational problems of the more highly educated blind.
(111) Suggestions for future work.

I. INVESTIGATIONS INTO PROBLEMS OF WORKSHOP ENVIRONMENT.

(1) Scope of investigation.

In order to compare the earning capacity of the totally and partially blind workers and investigate the influence of vision, wage records of 173 men and 43 women were studied, tests of manual dexterity were applied to 181 men and 96 women. The examinees were grouped according to trades to allow for variations of trade conditions and training.

(2) Results.

(a) Study of wages.

The examinees were divided into three age groups (20 - 29)(30 - 39)(40 and over) and two vision groups, totally and partially blind. The data obtained leads one to believe that between the ages 30 to 40 there is in both vision groups a drop in earnings and that wage differences between totally and partially blind is approximately 10%.

(b) Quality of work.

There is no evidence that in general some compensatory power of "Concentration" enables the totally blind to excel or even always to equal the work of the partially blind.

(c) Influence of age.

Dexterity tests, necessitating collecting material for assembly, definitely showed that speed is reduced with increase of age. Where, however the material worked on did not require transfer from place to place, age made little difference.

(d) Influence of vision.

See item (c).

(e) Influence of trade.

The results of the dexterity tests applied both to men and women showed that for the totally and partially blind the higher skilled their trade, the better their success in these tests. The male boot-repairers and the women weavers gained the first place when the workers are ranked by trades

(f) Comparison with the seeing

The results of dexterity tests given to blind and sighted people proved that in nearly all cases there were large differences in effective skill, and that the effect of blindfolding the sighted was not altogether to equalise their effieiencies.

(3) Conclusions.

(a) The potential efficiency for occupations of a manual kind of a partially blind person, is not generally reduced as much as that of a totally blind person.

(b) The occupations at present carried out in the workshops for the blind, being chosen because of their suitability for the totally as well as partially blind, do not permit of much difference between the earning capacities of the two groups. Hence it may be concluded bearing in mind the results of the dexterity tests, that if the totally blind were placed in occupations suitable for the partially blind, and ipso facto less suitable to themselves, their efficiency would be lower.

(4) Recommendations.

(a) To encourage the partially blind and those totally blind but with factory experience to consider employment under factory conditions and to reserve the present occupations mainly for the totally blind.

(b) To use the "Team" method combining blind and seeing workers to its fullest extent both in blind and sighted factories. New trades could then be introduced into existing Institutions.

(c) To set up an experimental workshop and training school to enable processes and methods of organisation to be tried out.

II. VOCATIONAL PROBLEMS OF THE MORE HIGHLY EDUCATED BLIND.

(1) Enquiries made.

Worcester, Chorley Wood and the Royal Normal College have been visited, only at the latter was vocational training in force.
The number of pupils to be launched out on a career was found to be from 18 to 20 per annum (piano-tuners excluded).
Lists of occupations and careers for which secondary schools and University education are highly desirable were compiled and the practicability of employing blind persons in them considered. The results left a list almost identical with the occupations already followed.

(2) Recommendations.

(a) To explore co-operative activities of a business type, i.e. management of small shops such as newsagents, tobacconists, tea-rooms, etc.

(b) To increase the openings in occupations already attempted.

(c) To train boys as well as girls in shorthand-typing and business methods .

(d) To consider the advisability of adopting vocational training in all colleges bearing in mind that the attainments of a blind boy or girl of 21 will normally only equal that of a sighted child of 17.

III. SUGGESTIONS FOR FUTURE WORK.

The problems for future investigations which arise out of this report are:-

(1) On the industrial side.

(a) The selection of suitable processes in which to train blind persons.

(b) The selection of suitable persons for training.

(c) The methods of training.

(d) The methods of organising blind labour in workshops and factories.

(e) The co-operation of employers in securing employment.

(2) On the professional side.

(a) The study of the processes of education and the limitations of blindness (in preventing studies such as science and mechanics).

(b) The determination of the best vocational training and the methods of giving it.

(c) The finding of opportunities for employment.

(3) General.

The whole problem of vocational training and education as effected by blindness.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

F O U R T H

REPORT OF INVESTIGATION

FOR

THE NATIONAL INSTITUTE FOR THE BLIND.

Investigator: A. H. Seymour.
Period : January - March, 1929.

STUDIES AT THE SWISS COTTAGE WORKSHOPS.

I. INTRODUCTION. (pp.1 - 4.)

1. Some Differences between Blind and Sighted Workshops.

(i) The small numbers employed.
(ii) The large variations in capacity of the workers.
(iii) The temperament of the workers.
(iv) The movement of the worker.

2. Some Notes on the Basket Department in which the present investigation took place.

(i) The variety of articles manufactured.
(ii) The variations in material.
(iii) The ventilation and heating of the workshops.
(iv) The partially blind workers.
(v) Incentives.
(vi) The sale of goods.
(vii) The traditions of the workshops.

II. PROCEDURE OF INVESTIGATION AT THE SWISS COTTAGE WORKSHOPS.(pp.4 18.

1. Arrangements for the Storage and Delivery of Material.

2. The Processes of Manufacture.

(i) The preparation of materials.
(ii) The methods of work.

3. The Conditions of Working.

(i) The size of pitch and interference of the workers.
(ii) The lay-out of the pitch.
(iii) The lighting and ventilation.

4. Individual Differences.

5. Methods of Improvement Suggested.

(i) Planning a suitable holder for the material.
(ii) Planning a new tool case.
(iii) Planning a new seat.
(iv) Photograph of the frame in use.

6. Summary of Experimental Results.

7. Analysis of Experimental Results.

8. Recommendations.

9. Benefits to be gained by the alterations suggested.

I. INTRODUCTION.

1. Some differences between workshops employing blind persons and factories employing seeing persons.

It is important to realise at the outset that there are considerable differences between a workshop for the blind and an ordinary industrial undertaking and that in the former there exist a number of special conditions which influence the economic problems of manufacture and sale.

The restriction imposed upon the worker by his blindness in his daily life as well as during his hours of employment must be taken into account in determining what readjustments can best be made. The point of view of the blind man especially needs careful consideration in an investigation of this kind.

It may be of value therefore to describe briefly some of these differences.

(i) The small numbers employed. The numbers employed in any branch or department of a workshop may vary from 6 to 30. Hence the larger problems of the planning and distribution of the work do not arise.

(ii) The large variations in capacity of the workers. In addition to the ordinary variations of capacity from one individual to another there are at least four distinct groups of workers to be found among even a small number of blind employees:-

(a) The partially blind trained in a blind school.
(b) The totally blind " " " " "
(c) The partially blind trained in later life.
(d) The totally blind " " " "

The workers have been trained, therefore, in different ways and on different kinds of material and since their abilities vary it is sometimes difficult to give every man the work which suits him best. It happens, also, that if a particular type of article is required in large quantities all the workers, including some unsuited in many ways to the tasks, have to help in executing the order. It is extremely difficult to engage additional employees for these emergencies and so contracts which stipulate that goods should be delivered in a short time can seldom be undertaken.

(iii) The temperament of the worker. Temperamental qualities affect the worker in all industries but in blind workshops there appears to be a problem of special difficulty. It seems desirable, since blindness affects people in so many different ways, to approach the study of the workshop for the blind much more from the standpoint of the individual worker, than is required in an ordinary factory. For instance, one superintendent stated that the kind of religious training which the girls in her department had received had a considerable influence, not only on the well being of the worker, but also on the actual production of articles.

(iv) The movement of the workers. In any workshop for the blind, especially where the lay-out of each pitch is not standardised, it is difficult to move workers from place to place without incurring, at least for some time, a considerably greater loss of production than would be sustained in an ordinary factory. This diminution in output is principally due to the fact that the blind worker takes some time to accustom himself to a strange pitch and to a new auditory environment.

2. Some notes on the basket department in which the present investigation took place.

(i) The variety of articles manufactured. In the basket department many different kinds of baskets have to be made in quantities which vary from week to week; many repairs and special orders have to be executed.

It follows, therefore, that the individual employees cannot be retained on the kind of work for which they are best suited for any length of time but may have to change their work as the necessity arises.

(ii) The variations in material. The material for any given type of hamper or basket varies considerably in quality, length, degree of soaking and sorting, and flexibility. These differences in the quality of material greatly affect the time taken to make the article.

(iii) The ventilation and heating of the workshop. The materials used require a damp heat for satisfactory manipulation. Many blind men are unable to work sufficiently fast to keep themselves warm and

are therefore dependent on external heating. The shops tend to become very warm and it is difficult to maintain a constant movement of hot air in the building.

(iv) The partially blind workers. These employees are very prone to use what little sight they have and since this tends to be inadequate a loss in speed often results. These workers are also more liable to distraction than the totally workers and have to give far more attention than a seeing person in order to grasp the significance of some event in the shop. Their work is therefore, as a rule, more intermittent than that of the blind workers.

(It would be interesting to know whether it would be better to train some of the partially blind under conditions which would avoid the use of vision so that they might make better use of tactual and kinaesthetic processes.)

(v) Incentives. It seems to be recognized that in a large number of cases the blind worker tends to regulate his production by his own financial needs rather than by his abilities or by the requirements of the factory. This financial need often appears to be a small one especially in the case of single workers.

(vi) The sale of goods. The value of increased production is dependent on the disposal of goods manufactured. At present, this is a source of considerable embarrassment to the managers of blind workshops. Although not directly part of this investigation the question of disposal of finished goods is obviously an extremely important factor in the success of the workshops.

A superintendent expresses the situation in the following terms:- "The decrease in production during this cold spell has helped to relieve the congestion which was arising due to the heavy stocks accumulated during the previous weeks, when, owing to the number of men permanently employed far more articles were made than could be sold."

To increase production merely to make articles for stock would inevitably lead to a serious situation.

(vii) The traditions of the workshops. Each workshop has gradually developed from a small beginning; in a few cases, only, has it been possible to plan the shop on definite lines. Each

foreman has endeavoured to develop his industry in the way best suited to the growing needs of the institution. It is not surprising, therefore, that opinions, methods, and traditions differ from workshop to workshop and that ways of working have grown up which may not be wholly suitable.

II. PROCEDURE OF INVESTIGATION AT THE SWISS COTTAGE WORKSHOP.

The following matters received special attention and study:-

1. Arrangements for the Storage and Delivery of Material.

The various kinds of material (cane, rods etc.) are kept in small sheds adjoining the main basket shop; the material is roughly sorted but not graded according to quality or size. The men receive the material they require from the foreman or assistant (full vision) at the shed from 8.0 - 9.0 a.m. and from 1.30 - 2.0 p.m. The blind workmen have then to arrange for most of the soaking, transporting and sharing of the material. In some cases one man is responsible for a certain kind of cane and others obtain it from him; in return they prepare another kind of cane for the rest.

The use of the rack and new system of "routing" etc. described on pages 8 and 17 would simplify the procedure, ensure adequate sorting, and save much of the time spent by the blind in moving from place to place.

2. The Processes of Manufacture.

(i) Preparation of materials. The material has to be well soaked in the tank. The tanks are out of doors and in the cold spell were frozen almost completely: the investigator took the greater part of half an hour to hack out material placed there on the previous day for experimental purposes.

The removal of material in such a frozen condition was quite a painful process, even for a sighted person and the hands were not in a condition for further work for some considerable time.

The heating of the tank by some type of "geyser" has been under the consideration of Dr. Ritchie for some time.

(It may perhaps be mentioned here that many difficulties have arisen during this experiment owing to delays caused by the frozen material being unsuitable for handling by the workers for long periods.)

When more normal temperatures prevail the blind have still to take their material and baskets to the tank, often in the rain and since they are not so speedy as a sighted man they get far wetter unless they take the time necessary to put on overcoats before seeking their material.

The new system of "routing" (page 17) will prevent loss of time and decrease the discomfort of the workers experienced in the soaking and moving of materials.

The wet material is then placed on the pitch and the worker has to dry his hands and stay for some time near the fire in order to warm himself sufficiently to continue work (this would not be so necessary in hot weather).

The worker then sits, either on a box of plank or more often on the floor quite close to the wet material. The damp rises from the floor aided by the heat and draughts and even when "hardened" to these conditions considerable discomfort is experienced by the men.

The metal tray in the bottom of the new rack described on page 17 would prevent any damp reaching the floor and decrease the inconvenience to the worker.

The draughts are greatly increased when the doors are left open - if springs were fixed to the various doors this trouble would be partly eliminated.

(ii) Methods of Work. These vary greatly with the kind of article to be constructed and the type of material available.

Great inconvenience is caused to the workers when others engaged on the same kind of task come for material. In many cases the investigator helped in the search for the lost tools which were found buried under the material. The cane is difficult to pull out of the bundles especially for those without sight. The man on the pitch often aids the borrower to obtain his material (the latter often stays to select a "bit of good" as it is termed) and thus valuable time is lost.

The conveying of the material borrowed is not easy, especially if the gangways are blocked.

Each piece of material as it is required has then to be inspected somewhat carefully by the worker to ensure that it is suitable for the portion for which it is needed.

The use of separate racks to be filled by a sighted man containing prepared and sorted material will eliminate the waste of time due to the methods now used. (pages 9, 11 and 17.)

Many of the baskets have to be taken to the tank for soaking (the slower the worker, the more often this has to be done). The proposed alterations would save considerable time in this operation.

The tools are either placed under the legs, at the side, or in the box. The time lost in searching for them could be saved by a special form of tool rack. (page 12)

As the height of the work increases various devices such as the raising of the board by suitable blocks or the use of the seat have to be resorted to in an endeavour to keep the man on a convenient level with his work. Very often this is not possible and a strained position has to be adopted, this is almost more noticeable among the hamper makers than the basket makers. The type of seat experimented with (page 13) would remedy this defect to a large extent.

The hamper makers have to prepare their stakes (usually about four feet long) from very long rods which are very cumbersome to cut by hand on the pitch. These large stakes have then to be sharpened at one end and fixed into a frame. Considerable time would be saved if the stakes were prepared as suggested (page 17).

3. <u>The Conditions of Working</u>.

(i) <u>Size of Pitch and Interference of Workers</u>. The accommodation in this workshop is limited and therefore the pitches are not as large as those used in some blind factories.

The available space is further reduced by the fact that the floor space of the pitch is not only used for the making of the basket but also for the storing of a large quantity of material. The use of the racks, both large and small will considerably decrease the amount of floor space required for the material. (page 9)

The workers when swinging the cane, (usually from left

to right) frequently cause their neighbours extreme discomfort and in some cases annoyance, either due to the cane striking them or getting mixed with their work.

(In one case the timing of one man had to be suspended for nearly a quarter of an hour due to a blow in one eye by cane from the next pitch.)

The rack which has since been devised placed at the side of the pitch acts as an effective shield for the next worker without interfering with the swinging of the cane (page 11).

(ii) Lay-out of Pitch. The pitch where the man usually works has about 12 - 18 inches at each side occupied by a bundle of cane or rods. The bundles of canestretch almost to the centre of the room and are usually covered with damp cloths. Part of the gangways, especially at one end, are filled with rods and small cane; the centre of the room is often occupied by finished baskets.

The rack proposed will considerably increase each man's effective working space and save much of the time now spent in the sorting of material. (pages 8 - 12.)

The tools, when not in use are kept in the box (placed in the middle of the pitch, against the wall) which is also used as a seat.

The proposed tool rack will enable the worker to obtain his tools much quicker than before. (page 12.)

The hamper makers set up the bottom and lid in a frame - it would be an advantage if this had metal studs at distances of one inch apart (similar to the yard stick) to obviate the necessity of measuring the distances between the rods every time.

(iii) Lighting and Ventilation. The lighting of the shop does not of course affect the totally blind but there are many partially blind workers who use their imperfect vision to aid them in their work. Unfortunately their sight rapidly decreases as twilight comes on and the electric lights are too high to be of much use to them.

It would be possible to lower these lamps at certain times if the partially blind who were affected in this way could be grouped together. Care would have to be taken that the lights were not

damaged by materials carried by employees when passing along the gangways.

The problems of ventilation has been mentioned before - further extensive experiments would have to be conducted before the best method of improving the ventilation at present in use could be found.

4. Individual Differences.

Some workers are able to make several basket bottoms one after the other since they can maintain the inverted position required i.e. "stand on their head" without any strain. Others are only able to complete one such bottom before onset of feelings of dizziness or headache. Some workers make a complete basket before commencing another; others reserve a half day for the fixing of handles and binding to baskets partly completed. It was obvious that the better workers (especially among the hamper makers) attained a high degree of rhythm in their movements which in past accounted for their success. If a constant supply of suitable material is not maintained, the rhythm tends to become broken.

Interesting data would probably be obtained from inquiries into the effects of these differences (page 9). The results would probably be useful to the training department as well as the workshop.

5. Methods of Improvement Suggested.

The possibility of improving production was considered from two aspects:-

(a) The alteration of layout (the introduction of new appliances), routing, and general methods of work.

(b) The subdivision of labour, team work etc. This would involve an experiment on a large scale to determine the abilities of each man in each type of basket made. This kind of organisation would also be influenced to a considerable extent by the orders received.

It was decided after consultation with Dr. Ritchie and Mr. Earle to concentrate on the first group of problems.

(i) Planning a suitable holder for the material. This was the first piece of apparatus to be designed. The following kinds were considered:

(a) A horizontal rack which would keep the material as it is at present but in a more systematic and tidy way.

(b) A revolving rod or drum over which the various kinds of cane could be suspended and drawn down (through guides) by the worker.

(c) A rack divided into various compartments in which the cane and rods could stand.

It wasdecided that (a) would do little to relieve the floor space and would not effect any great improvement. (It is easier however to keep the material damp in a horizontal position.)

Various types of the second piece of apparatus were fitted on an experimental bench. It was found however that the cane "stuck" too frequently and that it was impossible to guide it sufficiently for use by the blind.

A simple three compartment rack was then installed on the left hand side of the pitch (dimensions 2 feet by 10 inches by 8 feet 6 inches).

It was necessary to have the side bars on hinges so that they could be opened to place the material in position. Provision was made for a metal tray at the base to catch any moisture which would otherwise reach the floor.

The workers were timed on the different kinds of baskets and hampers (the difficulties encountered in timing have been mentioned before).

The workers were then asked to make the basket on the experimental pitch - many of them not only agreed but offered suggestions which enabled improvements to be made.

The material in each experiment was prepared and placed in the frame by the investigator. It was found that it could be moved in and out easily in bundles and could be withdrawn strand by strand without difficulty by even the totally blind. The sorting into the various kinds was an advantage - guides were placed on

the frame so that the kind of material wanted could be obtained immediately.

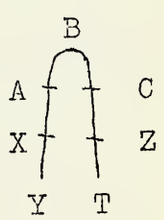
The long cane was divided into two and placed in the upright position and the hinged bar swung into place.

The results of the use of the frame are given on page11 , various alterations had to be made, however, in the design.

It is very necessary that the frame should be easily adaptable to any kind of material as changes have to be made quickly when new orders arrive.

One compartment was therefore provided with a lower hinged bar to take small rods used in certain kinds of hampers and baskets. This hinged bar could be moved out of the way when cane was being used.

Further difficulties with the unwieldy cane were experienced. The "siding" could be cut into two positions without involving any waste. The staking however is really needed in the double length since if it is divided at E stakes YX, XA, TZ, ZC can be obtained from one strand but portions AB, BC are not long enough separately and too many odd portions are left over and cannot all be used up for bottom sticks.



Two other hinged bars had therefore to be introduced in the staking compartment to separate the ends of the double cane and allow the double strand to be used.

A further and more difficult complication was found when supplies of material shaped had to be dealt with. It was far too wasteful to divide this at A and the various small pieces became entangled in the main bundle and consequently the cane could not be withdrawn easily. Another hinged bar was therefore introduced in order to divide these ends from the main bundle; the best position for this bar, i.e. one which would not interfere with the withdrawing of the cane, was difficult to find.

It was necessary to experiment for a long time with the position of these bars and compartments until it was practically certain that the cane or any other material could be both easily introduced and withdrawn from any part of the frame.

The workers on the pitch appreciated the fact that the frame acted as a shield, warding off the cane swung by their neighbours. No man working on the frame received a blow of any kind from another worker's cane; although this interference was in many cases merely an annoyance long delays had been caused in some cases by injuries to the face, especially the eyes.

The frame was found to be slightly in the way when a somewhat large basket was being 'set up'. This could however be eliminated almost completely by rotating the basket bottom and stakes in course of erection at any convenient angle to the floor and in this way obstruction by the frame was avoided.

(It would be possible perhaps at a later stage to make the whole frame capable of rotation on a swivel arrangement so that it could be set back against the wall when extra large baskets are being made. This has not been attempted at present.)

One of the most important problems in this connection remains to be discussed.

The material must be kept reasonably damp; this is more important for the rods than the cane. The moisture is more easily prevented from evaporating when the material is lying on the floor than when it is placed in the vertical frame.

Some means of keeping the material suitable for easy handling had to be found.

The following methods were considered:

(a) Drops of water might be allowed to run down the cane or rods from time to time. A container over a perforated zinc sheet could be placed above the frame. The metal tray at the base would catch any water which reached the bottom of the rods.

(b) The material could be damped at intervals with a fine spray- care would have to be taken to keep the spray

from spreading beyond the frame. This could be prevented to some extent by fixing a sheet of metal or wood at the back of the rack.

(c) By so altering the system of routing and storage in the tanks that the frames can be easily refilled twice a day with damp material. The cane left in the rack would then be placed in the portion of the tank reserved for it.

It was decided that (a) and (b) would be difficult to arrange and would need constant attention. The use of method (c) supplemented by an occasional spray if necessary was considered the most convenient.

(ii) Planning a new Tool Case. The following tools comprise the basket makers' outfit:-

2 Knives - small and large.

2 Bodkins.

1 Shell Bodkin - for Repairs.

1 Cane Squeezers.

2 Pairs of Shears.

2 Shop Irons.

1 Yard Stick (for measuring)

1 Cleave)
1 Shave) (for Fancy Goods)

2 Mallets.

These are kept in the box which is used as a seat. Only five tools are usually required on one basket, these as has been explained before are often mislaid and time is lost in recovering them.

Two kinds of holders could be used -

(a) A holder or rack consisting of a piece of metal or cane bent into loops and fixed on to a board.

This type of rack is used in a workshop employing seeing men. It would however be difficult for the blind to place the tools quickly into so small a compartment and there would probably be a tendency to pull the tool out with considerable force if it did not slide easily. The rack

would soon be damaged by such rough treatment.

(b) A fairly large size tray was made consisting of five compartments each 3 inches wide 12 inches long and 2 inches high. The yard stick can be placed against the raised back of tray.

The blind man can "throw" the tool quickly into its compartment and knows after a little practice where to obtain it again when it is required.

The tool rack is placed on the right hand side of the worker so that the cane - withdrawn from the rack with the left hand can easily be prepared with the tools.

(iii) Planning a new Seat. Some form of seat on a "ratchet" or "jack" principle appears to be the most satisfactory. This could be then adjusted to a suitable height by the worker as the altitude of the basket increased.

This (as far as is known at present) would be too expensive a form of seat - another box or set of boxes is being experimented with but it seems difficult to find one which will satisfy all the requirements to any large degree.

(iv) Photograph of the Frame in Use.

The above photograph of the rack in use illustrates some of the points mentioned on pages 9 - 12 and in particular the way in which each piece of cane is so guided that it can be easily withdrawn from the frame and examined before it is worked into the basket.

6. Summary of Experimental Results.

Name.	Speed of Work.	Age.	Degree of Vision.	Experience.	Decrease in Time.
Edwards.	Slow	59	Nil	30 years	57½ minutes 25%
Pratchett.	Slow-Medium	43	Partial	15 years	50 minutes 33.3%
Holdsworth.	Medium-Fast	40	Nil	6 years	20 minutes 14.3%
Bootes.	Fast	35	Nil	15 years	19 minutes 17.4%
				Average Saving	22.5%

7. Analysis of Experimental Results.

Name.		Prep. Material and Bottom.	Setting up.	Side.	Border.	Handle.	Total.	Note on the Temperament of Worker.
Edwards.	A.	66	51½	82½	30	-	230 mins. (3hrs 50mins)	Exceedingly steady worker. Works rather "on his own" and resents the interference of others. Shows considerable interest and co-operation.
	B.	18½	36½	95	22½	-	172½ mins. (2hrs 52½ mins)	
Pratchett.	A.	20	35	75	20	-	150 mins. (2hrs. 30mins)	Slow worker. Shows a lack of enthusiasm and interest (partly due to "home" conditions). Frequently "rests" in his work.
	B.	10	20	55	15	-	100 mins. (1hr. 40mins)	
Holdsworth.	A.	30	25	62	23	-	140 mins (2hrs. 20mins)	Steady worker. Realises he is slow but attempts to counteract this by working at his maximum rate. Has home responsibilities and tries to make progress.
	B.	12	19	68½	20½	-	120 mins (2 hrs)	
Bootes.	A.	10	17	39	10	33	109 mins. (1hr 49 mins)	Very willing speedy worker. Hurries too much to make a good article. Co-operated willingly.
	B.	10	14	36	30		90 mins (1hr. 30mins)	

A = Ordinary Time (average)

B = Time on Experimental Bench (average).

8. Recommendations.

(i) With a view to the use of one type of frame or rack suitable for all kinds of material, it is suggested that every pitch should be fitted with:-

A. A rack or frame for material on the right hand side containing

(a) Three compartments (1) 6" x 12"
(2) 10" x 12"
(3) 10" x 12"

(b) The necessary bars and fittings mentioned on pages 9 - 12 to enable all kinds of material to be used.

B. A Tool Rack described on page 12.

C. An adjustable seat - (when the best design has been decided upon and proved satisfactory by experiment).

(ii) Provision should be made for the employment of an assistant (full vision) to the Foreman whose duties should include (inter alia) the following:

1. Arranging and sorting of material from the sheds.
2. Arranging of material in the tanks.
3. Ascertaining of the needs of each man for the following day.
4. Filling each rack with the quantity and quality of material required.
5. Cutting of stakes etc. for hamper work.
6. Oversight of frames.
7. Re-filling of frames at certain intervals or when necessary.
8. Soaking the baskets (in a special part of the tank) for the men and returning them when required.
9. Emptying the frames at night.
10. Preparing the material for next day.

The man appointed for the work could first familiarise himself with the workshop and the materials and then follow the investigator in the above routine for several days.

9. Benefits to be gained by the alterations suggested.

The advantages of the lay-out and system of routing above described may be summarised as follows:

(i) More orderly storing, sorting and soaking of materials.

(ii) Increased comfort for the blind.

(a) Elimination of the ill effects due to damp.

(b) Decrease in the amount of moving about necessary, especially for the soaking of material and baskets in the tanks and the collection of material from other men for the work.

(c) The change from one type of work to another is made easier.

(d) The difficulties of preparing large stakes on the pitch are removed.

(e) The danger of injury from the swinging cane of the next worker is eliminated.

(f) There will be a decrease in the number of obstacles encountered when moving about and a larger area for work on the pitch.

(iii) An increase of 20 per cent. in gross output with less fatigue for the workers.

(iv) A net decrease of 10 per cent. in working time throughout the workshop.

(v) A continuous flow of work which can easily be regulated to the speed required.

12th April, 1929.

(Signed) C. S. Myers.
Director.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

F I F T H

REPORT OF INVESTIGATION

FOR

THE NATIONAL INSTITUTE FOR THE BLIND.

Investigator: A. H. Seymour.
Period : March - April, 1929.

STUDIES AT THE TOTTENHAM COURT ROAD WORKSHOPS.

I. INTRODUCTION. (pp.1 - 2.)

1. Some Effects of Blindness on the Employees.

(i) The relative isolation of the worker.
(ii) The lack of co-operation of the blind with sighted persons.
(iii) The mental strain of the blind.

II. ALTERATIONS SUGGESTED IN THE WORKSHOP. (pp.2 - 15.)

1. The Storage Department.

2. The Sorting Department.

3. The workshops.

(i) The delivery of material.
(a) Willow.
(b) Cane.
(ii) The quality of the material.
(iii) The advantage of more detailed supervision.
(iv) The utilisation of 'waiting time'.

4. Methods of Manufacture.

(i) Experiment with cane baskets.
(a) Preparation of material.
(b) Introspection of subject.
(c) Experimental Results.

(ii) Team work experiment.

(a) The planning of the experiment.
(b) Preparation of material.
(c) Progress of the experiment.
(d) Team work and craftsmanship.

(iii) Summary.

I. INTRODUCTION.

1. Some Effects of Blindness on the Employees.

The alteration in outlook and mentality of the workmen caused by blindness is a source of considerable difficulty to those in charge of workshops for the blind.

Three of the most striking effects of blindness may be briefly discussed here:-

(i) The relative 'isolation' of the worker. It is necessary for the employee to give very careful attention to each step in the construction of the article and to work with as continuous a rhythm as possible; otherwise, neither the quantity nor quality of baskets can be made such as to yield a satisfactory wage. It is impossible for the worker to become informed of the various happenings in the shop or what others are doing without enquiring from each of his neighbours; this causes a considerable delay due to the loss or slowing up of the rhythm of work. On account of this restricted environment and lack of external stimuli many of the blind men become very self-centred and reflect to a large extent on their own problems: this 'brooding' is often the cause of many of the difficulties encountered when dealing with the blind and tends to lower the vitality and after some time the production of the worker.

Suggestions are made by the investigator (pp.12, 13 and 14) which would tend to reduce this 'isolation' very considerably.

(ii) The lack of co-operation between the blind and the seeing. The blind seem to some extent, to resist the advances and offers of co-operation from those employees who can see, and to become suspicious that they are not being fairly treated.

This attitude cannot be wholly accounted for by any unfortunate experiences the various individuals may have had in their relations with sighted persons. It seems that this distrust is due to the fact that the activities of the sighted persons are under the ordinary workshop conditions largely unknown to the blind employees and are outside their control; they, therefore, do not readily co-operate with the workmen and supervisors who can see. This distrust and self-interest shows itself, also, in their relations with their blind colleagues. Suggestions have been put forward (pp.11,13) which, it is thought

will tend to reduce these tendencies of the blind employees.

(iii) The mental strain of the blind. Some of the other factors which contribute to the mental strain which seems to be greater among blind than sighted work people are

(A) The difficulties of travelling and moving from place to place in the workshop.

(B) Anxiety with regard to the amount likely to be earned during the week.

This is often influenced by:-

(a) The alterations in speed and ease of work due to the frequent changes in health.

(b) The alteration in 'feeling' which takes place in the two hands as the temperature rises or falls.

(c) Difficulties due to variation in quality of the material.

(d) The difficulty of sorting out suitable material from large bundles.

Suggestions are made with the object of reducing the mental strain of the workers. (pp.6, 7.)

II. ALTERATIONS SUGGESTED IN THE WORKSHOPS.

1. Storage Department - Basement.

The material is stored in the basement which is large and convenient in design. The bundles, after coming through the chute, are stacked on top of one another in various parts of the room.

When a particular bundle is required time is lost in re-moving and replacing those bundles which happen to be on top of it. Some of this time could be saved if the bundles were arranged vertically in order of the size of the material so that the required quantity or quality could be easily obtained. This systematic arrangement would also enable the foreman to find out quickly the amount of different kinds of material in stock.

2. The Sorting Department - Ground Floor.

The material is sorted by two men (one blind, the other sighted) on a method which if strictly adhered to would give excellent results.

It seems, however, that the material is prepared at present in a very 'hand to mouth' way. This means that the blind have often to leave their work, descend the stairs and wait in the sorting department for material which may not be either sorted or soaked at the right time. Another result is that the blind often stay to talk over various matters with their colleagues in the sorting and joinery departments, and so lose time.

Considerable time and trouble would be saved both by the blind and sighted if the sorting and preparation of the material were done for the portions of the particular orders required over a period of several days instead of for the immediate needs of individual men.

When it is known that a number of certain kinds of baskets will be required the material could then be obtained from the storage department and sorted into various receptacles ready for delivery to the workmen.

As an illustration of the present lack of system it may be mentioned that when the material for the plate baskets had been sorted into the various sizes the bundles were mixed up on a shelf and had to be carefully looked over before they were delivered to the workmen. This delay could be lessened considerably by using partitions to separate the various bundles.

3. The Workshops. 1st and 2nd Storey.

(i) The delivery of material.

(a) Willow. At present part of the material is delivered to the blind and the rest they fetch themselves from the sorting department. Time is always lost when the blind move about in search of any articles required for their work.

A considerable amount of this time could be saved if, after the material had been sorted for the various orders the foreman were to inform the sorter of the work which he had assigned to each man. The material could then be taken up for several

men sitting near together or for a number of men doing a similar kind of work.

If the material were prepared on the previous day each man could be adequately stocked in the early morning for the rest of the day (or half day) and the sorters would be practically free to replenish their stocks, prepare for fresh orders, or deal with single articles.

(b) Cane. The willow and buff rods are sorted for the men engaged on the type of basket requiring this material but the cane workers have to sort the material themselves. The bundles of cane are extremely unwieldy and very often cannot be 'worked right out' and therefore an accumulation of one kind of cane (siding, staking or finishing) takes place on the workers' pitch. Another bundle has to be fetched from the stores and time is wasted in procuring the right kind of cane from the mixed lot on the plank. The man's tools also are frequently mislaid and are only retrieved from the pile of material after considerable loss of time and patience.

Much of this time would be saved if the cane were sorted and delivered as suggested in the following sections.

(ii) The quality of material. In basket making as in all hand trades the quality of material used plays a large part in determining the final cost of the articles and the ease with which they are made. It may be suggested here that when buying material in large quantities the following factors should be carefully considered along with the gross cost of the varying grades and the type of basket for which they are intended.

(a) The amount of sorting which will be required for the varying grades of material - the cost of sorting will in some cases be much greater for one grade of material than for another of a slightly higher price.

(b) The amount of unsuitable material in the lower priced bundles. This may either have to be kept for a long time (during which deterioration occurs) until it can be used up on some other work, or it may be entirely wasted.

(c) The quality of the finished article. (This is important for repeat orders.)

(d) The decrease in speed of production and increase in mental strain of the worker caused by inferior or unsuitable material. This matter is discussed below. (p.10)

(iii) The advantage of more detailed supervision. The efficiency of the whole workshop would be considerably increased if a more detailed supervision were kept by the foreman and his assistants but especially with regard to the following matters.

(a) The storage of material and stocks of different grades.

(b) The arrangement, in advance as much as possible, of the assignment of work for each man and the replenishing of stocks for the various orders.

(c) The preparation of material in advance by the sorting department for the orders given by the foreman.

(d) The delivery of material to the workmen.

(e) The progress of each individual's work; it is often possible to prevent the workman from continuing with a basket which is improperly shaped and to so alter it at an early stage that he is able to finish the article without wasting time in taking down unsatisfactory portions. This is more satisfactory than the rejection of the finished article and if tactfully accomplished helps towards a feeling of good will with the blind which is so desirable to foster.

(iv) The utilisation of 'waiting time'. The two or three men who are sometimes on 'waiting time' could during this delay be usefully employed in helping forward the preparation of material for the various orders. If the sorting department were well organised it would be possible to assign them a certain amount of work which would enable the preparation of material in advance to be carried out with ease. There would be then some return for the money expended in wages and the men would not

tend to become 'slack'.

4. Methods of Manufacture.

Two experiments were carried out by the investigator to discover the results likely to be obtained by altering the methods of the workshop and whether the blind could join together successfully to form a 'team' for the manufacture of those baskets which could be conveniently divided into several component parts.

(i) Experiment with cane baskets. The results obtained from the use of the frame at Swiss Cottage are given on page 9. It was considered desirable to test the use of the frame at this workshop over a full week and on a different type of basket. The baskets made during this experiment were of the reinforced type, i.e. an iron rod was introduced through the bottom and handles in accordance with certain L.C.C. regulations.

The basket-maker in this experiment was X. who co-operated most willingly and gave valuable suggestions and introspective notes.

(a) Preparation of material. A frame was made at Swiss Cottage (by kind permission of Dr. Ritchie) of dimensions 8 feet by 3 feet by 1 foot. and divided into three compartments (8 feet by 1 foot by 14 inches; 8 feet by 1 foot by 14 inches; 8 feet by 1 foot by 8 inches.)

It was considered better to cut the stakes into 39 inch lengths than to put doubled staking into the middle compartment. (This procedure has also been adopted at the Swiss Cottage Workshop.)

The siding was divided into two kinds, the smaller cane for the lower part of the side of the basket and the larger cane for the upper part of the side. Each hank was divided into two strands except when the hank was not of a suitable double length. The larger cane was placed in the middle compartment of the rack, the smaller siding in the first compartment and the handling, banding, and upsetting in the third division.

The frame was placed in the left hand corner of the plank and the stakes and bottom sticks on the right hand side.

The experiment was commenced on Monday April 8th and continued for one week (i.e. until Saturday April 13th.).

The frame which contained enough material for four baskets was filled each morning, the cane not used was taken out at night and soaked again if necessary.

It would be a great advantage if a cutter mounted on a bench were used for dividing the hanks of cane and preparing the stakes so that large quantities could be dealt with at one time. If the material were prepared in this way the filling of the frame would not take more than a few minutes each morning.

The material available during the experiment varied considerably in quality - the effect of this on production is discussed in paragraph (b) . Three baskets were made before the handles and bands were put on. The employee found that to handle each separately was not as quick as doing several at a time but that if more than three were attempted the fatigue rapidly increased.

(b) Introspection of Subject. The employee gave introspective notes on the effects of the new conditions of working. They may be briefly summarised as follows:

i. Decrease in Fatigue. The small decrease in physical fatigue may be partly due to the fact that a rhythm was reached and maintained for fairly long periods unbroken by searches for the right kind of cane.

ii. Decrease in Mental Strain. The decrease in mental strain was attributed to

(a) The feeling that everything was ready for the day's work when he arrived in the morning.

(b) Much of the annoyance due to the waste of time in searching for suitable material and buried tools was eliminated.

(c) The 'even flow' of the work.

iii. Satisfaction on account of the increase in production without greater fatigue especially as wages are low.

Summary of Experimental Results.at Swiss Cottage.

Worker.	Speed of Work.	Age.	Degree of Vision.	Experience.	Wage.	Ordinary Time.	Time on Experimental Bench.	Decrease in Time.
A	Slow	59	Nil	30 years	16/2	3 hrs.50 mins. Average.	2hrs.52½mins. Average.	57½ minutes. 25%
B	Slow-Medium	43	Partial	5 years		2 hrs.30 mins.	1hr. 40 mins.	50 minutes. 33.3%
C	Medium-Fast	40	Nil	6 years	£1.1.10	2 hrs. 20 mins.	2hrs.0 mins.	20 minutes. 14.3%
D	Fast	35	Nil	15 years	£1.6.11	1 hr. 49 mins.	1hr. 30 mins.	19 minutes. 17.4%

Average Saving 22.5%

(c) Experimental Results.

Employee : X- a tall powerfully built man at one time in the Irish Guards. A steady, willing and interested worker, who co-operated well with the investigator

Type of Basket. Reinforced cane basket.

Average Production before Experiment. 15 baskets per week.

Production during Experiment. 19 baskets per week.

Increase in Production. = 4 baskets per week = 27%

Specimen Timing before Experiment.

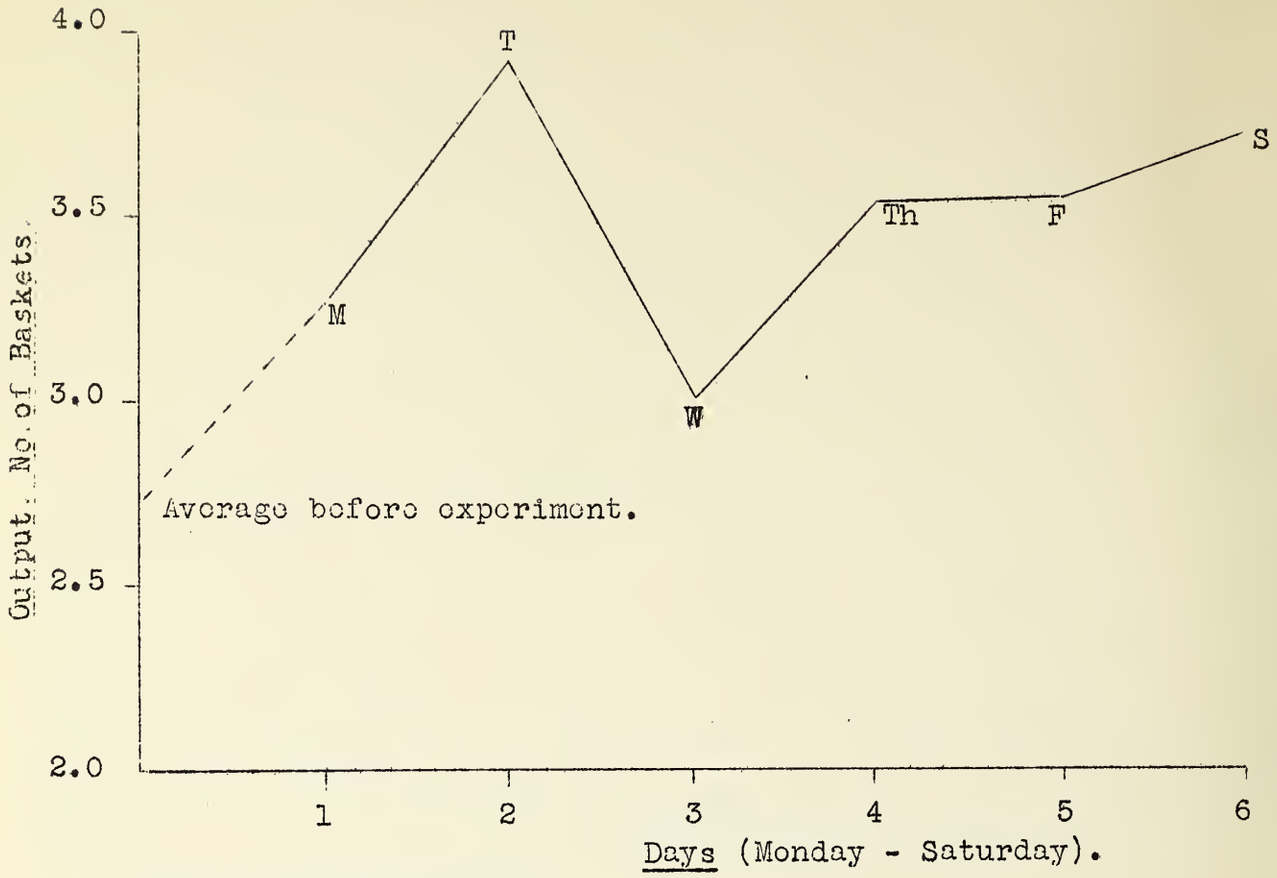
Commence	10.15	
Bottom	10.50	35
Stakes	11.0	10
Setting up	11.10	10
Break	11.25	
Side	12.40	75
Border	1.0	20
Total		2hrs, 30mins

Specimen Timing during Experiment.

Commence	8.30	
Bottom	8.50	20
Stakes	8.52	2
Setting up	9.0	8
Side	10.9	69
Border	10.25	16
Total		1hr.55mins

Daily Production during the Experiment. (Average production before Experiment = 2.73 per day.)

Day	No. Completed.	Partially Completed.	Total Production.
Monday	3	1 Stake & Setting up	3.26
Tuesday	4	1 Bottom	3.91
Wednesday	3	1 Bottom	3.00
Thursday	3	1 ¾ Side	3.54
Friday	4	1 Bottom & Stake	3.55
Saturday (Half Day)	2	-	1.74



Notes on the Work Curve.

1. The lowest output (Wednesday) is .27 above the previous average.
2. The highest output (Tuesday) is 1.18 above the previous average
3. The large drop from Tuesday to Wednesday is principally due to the poor material available. This resulting decrease in production along with the increased mental and physical strain should be carefully considered when material is purchased.
4. The production gradually rises on Thursday and Friday but never reaches the previous high level probably due to the fact that the rhythm was not fully restored.
5. There is a small spurt on Saturday - this was necessary to finish the last basket.

(ii) Team Work Experiment.

(a) The Planning of the Experiment. The manufacture of the plate basket was divided into five parts.

1. The bottom.
2. The staking and upsetting.
3. The siding.
4. The border and foot.
5. The partitions.

The handles were not put on until the experiment had been completed.

The four employees who volunteered for the experiment were:

1. E, who made the bottoms of the baskets. He is a good workmen and took considerable pains to ensure that the bottoms should be of the standard size: although an extremist in many ways (a Communist) he showed a great willingness to co-operate and made suggestions for the planning of the experiment.

2. F, who did the staking and upsetting. He is a very thorough worker but was slower than the others, when, however, he became interested in the experiment his speed improved.

3. G, who did the siding. He is an excellent and speedy worker who took a quiet interest in the progress of the experiment. His speed tended to decrease a little after the first day when he found that he was finishing his section of the basket sooner than F.

4. H, who put on the border and the foot. He is a most willing worker whose industry made up for a slight deficiency in speed.

The employees were asked to work at their usual rate so that the results of the experiment would be influenced as little as possible by alterations in the speed of the workers.

(b) Preparation of Material. The material was prepared by the investigator and consisted of:-

1. Sets of bottom sticks and liners.
2. Sets of corner sticks.
3. Material for the bottom and side.
4. Sets of stakes - these were 'sliped' at the end.
5. Upsetting.

The preparation of the material did not take a large amount of time (p.9.) but this could be considerably reduced by the use of a hand cutter for preparing the bottom sticks, corner sticks and stakes.

Transfer of the baskets.

The foreman suggested that it would be better for each man to work on his own plank as a change of pitch would probably affect for some time the man's speed and comfort. When the section of the basket had been completed by one man it was taken by the experimenter to the next worker. This movement of the basket could of course be greatly reduced in future team work of this kind.

(c) Progress of the Experiment. It was unfortunate that only 38 baskets of the original order remained to be manufactured when the experiment was planned. The data would have been more complete if a full week's work had been available instead of 4½ days only. The experiment was also delayed through the indisposition of E.

The partitions were run up by the men at the beginning of the experiment and whenever there was a delay in the delivery of the next basket. Two hours extra were required at the end of the experiment to finish the remaining 18 sets of partitions.

Two bottoms were made by E before the others commenced so that F had some work to start on straight away. The other members of the team made partitions while waiting for the first basket.

Experimental Results.

Production Prior to the Experiment.

E	9	baskets	per	week	=	7.4	per	4½	days.
F	7	"	"	"	=	5.7	"	"	"
G	10½	"	"	"	=	8.6	"	"	"
H	7	"	"	"	=	5.7	"	"	"
		"	"	"	=	—	"	"	"
				Total		27.4	per	4½	days.

Number of Baskets made during Experiment	=	38
(Less) Allowance for 18 sets partitions	=	2.7
		35.3

Increase in Production = 7.9 Baskets

=28.9 %

Preparation of Material.

Time for preparation of Stakes per day	=	30 minutes
" " " " Bottom Sticks"	=	8 "
" " " " Corner "	=	4 "
" " " " Siding etc. "	=	15 "
Total		57

Allowance for preparation = 1 basket per 4½ days.

Note:

The sliping of the stakes could be done in future team work by the men themselves - this would save 20 minutes of the time required for the preparation of material.

Increase in Number of Baskets (with allowance for preparation)

= 25.2 %

One of the most encouraging features of the experiment, apart from the actual increase in production, was the very noticeable way in which the team work tended to break down the isolation of the blind worker. Each member of the team (Mr. Bignall to a lesser extent, perhaps, than the others) took a considerable interest, not only in the progress of the experiment as a whole, but also in the work of each man. The following remark is typical of this attitude - "I wonder how A is getting on with the next one. I must push on with this one otherwise I shall keep C waiting". The slight variations in the quality of the work were also discussed.

After the first two days the team were left from time to time to carry on without supervision. Each man soon took a share in the extra work involved in keeping the materials and baskets in circulation and the efficiency of the team was hardly impaired.

There seems to be little doubt that if more ways of overcoming the isolated introspective state in which many blind men work can be introduced into the methods of the workshop a greater co-operation and a more healthy spirit will prevail not only amongst the blind themselves but in their relations with their sighted colleagues.

The regularity in the flow of production (generally from $8\frac{1}{2}$ to $8\frac{3}{4}$ baskets per day) was also most marked. This may be partly accounted for by the fact that if one part of the basket were made by one man at the time when the general speed of working was low another part would be made by some other member of the team when the speed of work was considerably higher.

The absence of large variations in the rate of production would decrease the difficulty of arranging the delivery of orders for a fixed date.

(d) Team Work and Craftsmanship. It has been suggested that team work may tend to decrease the sense of craftsmanship among the blind in the basket making trade. Each trainee, however, has to learn methods of making complete samples of each kind of basket before he is considered proficient. It is usually found both convenient and profitable in the workshop for a man to specialise

on three or four types of basket. The number of orders in which team work could be successfully carried out would not be large enough to interfere seriously with the sense of craftsmanship or the ability of the employee to make several types of basket satisfactorily.

5. Summary.

i. Investigations have been made into the following:-

(a) The effects of blindness on the employees.

(b) The arrangements and methods of work in the Storage and Sorting Departments and the Workshops.

ii. The result of certain experiments in team work and in the use of the special cane holder were as follows:

(a) An increase in production of 27 per cent. during one week in the manufacture of reinforced cane baskets followed the use of the cane holder.

(b) An increase in production of 25 per cent. in the manufacture of plate baskets by the team of blind employees

iii. The following proposals have been made.

(a) That an attempt be made to decrease the isolation and mental strain of the blind workman and to secure a greater desire on their part to co-operate with the management.

(b) That various alterations be made in the storage and sorting departments to decrease the amount of time lost in those departments.

(c) That the influence of the following factors on efficiency be carefully considered -

(1) The quality of the material used.
(2) Supervision.
(3) The utilisation of waste time.

Note. It is further suggested that if, and when, the proposals with regard to the alterations in the various departments and in the methods of work (especially in the cane department) are installed, the investigator should co-operate with the foreman in effecting these changes.

(Signed.) C. S. Myers.

Director.

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

S I X T H

REPORT OF INVESTIGATION

AT

THE NATIONAL INSTITUTE FOR THE BLIND.

PECKHAM ROAD WORKSHOP.

Investigator : A. H. Seymour.
Period : 7th May - 5th July, 1929.

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I. INTRODUCTION.

The scope of the investigation in the basket department included the study of the system of sighted supervision used and of the general organisation of the factory, and a short experimental study of the alterations in output due to changes in the kind of work performed. Some of the alterations recommended have already been carried out by the Manager and the rest are under consideration. Frequent changes in orders, the indisposition of some of the employees, and the short time available rendered it somewhat difficult to obtain as much experimental data as we should have desired.

II. THE EFFECT OF SIGHTED SUPERVISION IN THE BASKET DEPARTMENT.

1. The System of Sighted Supervision.

With the co-operation of the managers of Institutions the National Institute of Industrial Psychology is at present engaged on the problem of the employment of the sighted workers in workshops for the blind. It may therefore be of value to summarise here the problems connected with a well regulated system of sighted supervision such as is in operation in the Peckham Road Workshop.

In the basket department there are two sighted and one semi-sighted Supervisors working with approximately twenty-five men. There are several other semi-sighted men but they do not need much supervision.

The senior supervisor receives the orders from the Joint Managers and is responsible for the supply of raw material and for the delivery of the finished goods with the required labels: this occupies nearly twenty-five per cent. of his time.

The men are divided into two sections each comprising about twelve men. A sighted Supervisor looks after each section.

The semi-sighted man helps the employees wherever he is needed and works under the direction of the sighted Supervisor.

Since the Supervisor can only give one half-hour's help a day to each man in his section the time is so arranged that aid is given when the most difficult part of the basket is being made. While one man is being helped a careful watch is kept on the other men and they are notified immediately when any part of the work, such as the staking or siding, is not progressing satisfactorily. Faults can then be remedied at once, the quality being thereby improved and the time spent in taking down the work saved. This kind of work can be done by a sighted man far better than by a semi-sighted or blind Supervisor.

In the Institute's opinion it cannot be too strongly emphasised that the most important function of the sighted Supervisor is this prevention of error, rather than either the re-making of bad work or the finishing of various difficult parts of the basket.

During the course of the day several men may have to wait a considerable time before the Supervisor can give them the help or advice they need on a particular part of the basket. This waiting time is, however, more than compensated for by the improved quality of the finished article. It should, however, be possible to utilise some of this waiting time in proceeding with such extras as the lid of the basket or hamper.

The employees have to wait some time until the Finisher has done some part of the finishing before proceeding with the basket. This time is sometimes occupied in the preparation of any material which may be needed later in the day. (It would be impracticable for each man to take his work to a plank reserved for the Supervisor and to return to his own plank to proceed with other work.)

2. The Quality and Quantity of the Articles Made.

The quality of the articles appears to be considerably increased by the sighted help, especially as precautions are taken

to ensure that as little faulty work as possible ~~as~~ is allowed to be further worked on by the blind workmen. With this sighted aid it is possible to make many kinds of baskets which otherwise could not be made by the blind alone. The Institution is able to compete more favourably in the home markets, (with firms employing sighted workers and with foreign firms), in their special kinds of baskets than in the ordinary class of work. The quantity of work turned out is also increased, the wages records forming an interesting study in this respect.

3. The Employment of the Less Capable Blind.

The less capable blind, especially those who have lost their sight late in life, can be 'nursed' to become more efficient. They are therefore more advantageously employed when this system of sighted aid is used. This is a step towards the solution (so far as basket-making is concerned) of the most difficult problem of the satisfactory employment of these poorer classes of workman (as distinguished from merely giving them relief).

4. The Psychological Results of Sighted Supervision.

Some of the blind tend to rely too much on the foreman and there is therefore a danger of the blind man being allowed to lose a measure of his self reliance. This is prevented as much as possible by the tact of the Manager in encouraging each employee to make as much of the basket as he can do satisfactorily. A further and, from the psychological point of view, more important result of this system of sighted help is that the isolation of the blind worker referred to in Report V is considerably lessened. The blind employee is brought into sympathetic contact with several individuals during the day and his thoughts are therefore not so self-centred as before. This change of attitude has undoubtedly a beneficial effect, especially as the blind now feel that they are working, along with the sighted, for the advancement of the Institution.

III. THE LAYOUT OF THE FACTORY.

The premises are inconvenient for a factory of this kind: the finishing departments are separated from the main workshop, the stores departments are on the second floor, and the transport of articles is not easy. The plan of the building was carefully studied in collaboration with Captain Pollard and the Joint Managers. It was decided to make three alterations. -

1. The room marked A, (see plan Figure 1) at present used for baskets awaiting repair and for finished orders, should be used in future by the Joint Managers as an office. This should be beneficial in several ways.

   i. The Managers will be in a position to exercise a better control over the whole of the workshops and will not be so fatigued by constantly moving up and downstairs. Visitors and travellers can also be interviewed more conveniently in this room. If the machine shop is taken over by the basket department, the office will give an even more central control.

   ii. The room upstairs can now be used for further storage of special types of material and finished articles.

2. The room B (Figure 1) at present used to store the hand-cart and a few repairs, should be enlarged to the dotted line shown in Figure 1, the door widened and the planks cut to allow plenty of room for the transport of baskets and materials. This room can then be used for the storage of baskets waiting to be repaired.

3. The space next to this room, marked C in Figure 1, should be used for the storage of baskets waiting to be removed from the main workshop. The space D can then be used by the Picker, and the baskets transferred to room C when completed.

IV. THE LIGHTING OF THE FACTORY.

An investigation of the lighting conditions in the factory was conducted, using the lumeter. It was found that the lighting in the main shop was very satisfactory in all parts. This is probably due to the large area of glass in the roof. In the adjoining shop, however, where the partially sighted employees are engaged on rather small coloured material, considerable variations in illumination were found to exist (see Figure 2). This shop has very little daylight. The regular cleaning of the windows would be some small advantage, but artificial light will still have to be relied upon for the larger part of the day.

It will be seen that there are variations from 1.8 to 10 candle power. It is interesting to note that in pitch A (1.8 candle power) the employee much prefers the wrapping of trays to the making of the complicated lemonade trays. The poorness of the light may be one of the factors contributing to this preference; other factors are mentioned on page 10.

It may be pointed out that if the colour of the walls and ceiling were altered - preferably to a white colour - and the lighting re-arranged, more even and satisfactory illumination would be obtained. This change, if approved, could be carried out by the investigator.

V. THE SOAKING OF MATERIALS.

The tanks for the soaking of materials are situated in a small room very near the main workshop (Figure 1).

The sulphur smell from the bleaching hut cannot be removed; but the odour from the soaked hide is, at times, extremely undesirable. It would be a decided improvement if a separate tank could be used for the hide and if possible for repairs which are bound with old hide. The trouble could be avoided to a considerable degree if the hide tank, which need not be large, were fitted with a type of lid which the blind

employee in charge of materials could easily remove when necessary.

VI. VARIATIONS IN OUTPUT.

One of the difficulties with which managers of basket departments are confronted is that the large number of different kinds of articles required renders it impossible for a man to be employed for any considerable length of time on the class of article for which he is most fitted.

The following experiment was planned so that initial data could be obtained which would be of value in enabling such changes in output as arise from frequent alterations in work to be measured accurately. These changes could then be regulated so that the loss in output is reduced to a minimum.

The following experiments were conducted in the workshop.

i. Change from cane work to large rod work, - from Humpers to large laundry hampers. This work was performed by a totally blind and deaf man of about forty-five years of age.

ii. Change from small difficult buff work to more straightforward rod work - from garden baskets to letter baskets . This work was performed by an employee thirty years of age who was slightly deaf and almost totally blind.

iii. Change from large buff work to small rod work - from soiled-linen baskets to letter baskets. This work was performed by a young partially blind employee.

iv. Change from easy to more difficult fancy work - from trays to complicated lemonade trays. This work was performed by a partially blind employee.

Preliminary time studies were taken of the various kinds of work in order to obtain a satisfactory measurement of the time required for each part of the basket. The employees were given the work by the foreman without any special instructions. From time to time they were interviewed together with the other employees, and throughout they were not aware that any experiment was being conducted. (One or two, however, seemed to surmise that the

changes in the work had some connection with the investigation.) The results were expressed in terms of the value of each day's work. Unfortunately it was not possible in the time available to undertake more comprehensive studies of the hourly output.

Each experiment is discussed below.

1. Change from Cane Work to Larger Rod Work.

The worker was very skilled considering the difficulties due to his lack of sight and hearing.

If the work curves recorded on Graph 1 are examined it will be seen that this employee was far more successful with cane work than rod work. He was also able to sort and work out a bundle of cane to give the minimum of waste.

The work was divided into four periods devoted to -

A. The manufacture of humpers.

B. The manufacture of laundry hampers.

C. The manufacture of humpers.

[D. The manufacture of laundry hampers -
this latter section was not completed owing to the illness of the worker.]

i. In each of these periods a progressive increase in output was obtained which was broken only after the week-end and by a change of work.

ii. The worker is far more efficient at his lowest rate in cane work than at his highest rate in rod work.

iii. The increase in output during period A (5 days' duration) was 18 per cent
" " " " " " B (7 " ") " 28 " "
" " " " " " C (3 " ") " 11 " "

iv. On the first day of the C period the output was twelve per cent. below the maximum of the A period. There was therefore a considerable loss in output due to the period of seven days' rod work intervening between the two periods of cane work.

It is noteworthy, too, that since the output on the first day of the C period was four and a half per cent. above that on the first day of the A period and since in the first two

days of the C period a more rapid progress (to the extent of thirty-eight per cent.) was made, ~~that~~ the value of the practice in the previous period had not completely disappeared.

2. Change from Small Difficult Buff Work to More Straightforward Rod Work.

This worker was almost totally blind and slightly deaf but was an accomplished basket maker.

The work was divided into four periods devoted to -

A. The manufacture of garden baskets.
B. " " " letter "
C. " " " garden "
D. " " " letter "

The results are recorded on Graph 2. The following are some of the most important facts that were discovered.

i. A general tendency to increase in production occurs from day to day in each section.

The increase in production during period A (4 days' duration) was 25.5 per cent
" " " " " " B (7 " ") " 19.8 " "
" " " " " " C (3 " ") " 9.45" "
" " " " " " D (2 " ") " .9 " "

It is difficult to determine whether the smaller increases in production during the short periods C and D are due to the improvement in the average efficiency effected by the previous periods of practice or to other factors.

ii. The output on the first day of period C was 9.45 per cent. less than the maximum output of the A period reached on the last day of that period. The value of practice during the period A had evidently not been wholly lost, since the output on the first day of the C period was 14.5 per cent. above that on the first day of the A period.

iii. The output on the first day of the D period was 24.4 per cent. below, the maximum output of the B period which was reached on the last day of the period. But although it was 4.5 per cent. below the output on the first day of the B period it was 4.7 per cent. above the minimum of the B period. The fact that

the maximum output is recorded in each case on the last day of the period seems to indicate that further increases in production might have been obtained if the periods had been longer.

3. Change from Large Buff Work to Small Red Work.

This work was performed by a semi-sighted employee who was a steady worker.

The experiment was divided into four periods devoted to -

A. The manufacture of letter baskets.
B. " " " soiled-linen baskets.
C. " " " letter baskets.
D. " " " soiled-linen baskets.

The results are recorded in Graph 3. There were considerable fluctuations in production during the B period. These were partly attributable to the fact that several baskets were done in sections and on some days time was lost in changing from one to the other. The fall at the end of the A period may be ascribable to the 'Monday effect'.

The increase in production during period A (5 days' duration) was 14 per cent
" " " " " " C (3 " ") " 7 " "
" " " " " " D (2 " ") " 11 " "

The changes here are very different from those recorded in the fourth experiment. In the third experiment the change in work made little difference to the value of the day's output but there were considerable variations in output, in some cases as much as twenty-seven per cent. of the average production, from one day to another. The results recorded in Graph 4 show that the change in work was accompanied by a loss in output of nearly forty-seven per cent. of the maximum obtained in the experiment; there was however a gradual increase in production in each section, and there were few fluctuations.

These differences between the results of the two experiments are probably due to the fact that in the latter the change in work is not so great and that the employee in the third experiment is not so easily perturbed by changes as the employee in the fourth experiment.

4. Change from Easy to More Difficult Fancy Work.

This subject was the young employee in the semi-sighted shop mentioned on page 6. He was one of the most intelligent men in the factory and had he only possessed a greater determination to advance himself he would have been capable of filling a better post. He objected strongly to the change from the simple repetitive job (oval trays) to the complicated formation of lemonade trays. This objection seemed to have two main causes.

i. Internal Cause. The worker found that on the repetitive work it was possible for him to attain such a degree of proficiency that he was able to carry on his own trains of thought and to 'day dream' without serious interference with his output. The lemonade trays required much more careful treatment and attention.

ii. External Cause. The lighting on this pitch was not at all satisfactory (see page 5), the intricate work needed on the lemonade trays must therefore have given considerable extra strain to a partially-sighted man.

Both of these causes could be remedied to a large extent: the lighting was capable of re-arrangement, and the ambition of the employee could doubtless be gradually stimulated.

The experiment was divided into four periods devoted to

A. The manufacture of oval trays.
B. " " " lemonade trays.
C. " " " oval trays.
D. " " " lemonade trays.

The output recorded on Graph 4 increased in all the periods.

The increase in production during period A (4 days' duration) was 14 per cent
" " " " " " B (6 " ") " 40 " "
" " " " " " C (3 " ") " 2½ " "
" " " " " " D (2 " ") " 14 " "

The employee's previous experience and interest enabled him to work straight away on the oval trays with a much

greater efficiency than on the lemonade trays. It will be seen, however, that the practice gained respectively in the A and B periods has been of some value in the later C and D periods since the output on the first days of the two last periods are 6 per cent. and 6.25 per cent. greater than that on the first days of the A and B periods respectively.

The output on the first day of the C period is, however, 8 per cent. below the maximum attained in the A period, showing that a set-back in production has been ~~earned~~ caused by the introduction of the B period.

The output on the first day of the D period is 11.9 per cent. below the maximum output of the B period, which was reached on the last day of the B period, showing that a small set-back in production has been caused by the introduction of the short C period.

It may be noted also that the loss in output due to the change in work, discussed on page 9, is 47 per cent. of the maximum output during the experiment.

5. Results of Experiments.

The results can be conveniently divided into two sections.

1. The changes which appear to affect gross production (irrespective of the kind of article made). These, in order of magnitude are -

(a) Change from easy to more difficult fancy work. Experiment 4, page 10. This change resulted in an average decrease in production of approximately forty seven per cent.

(b) Change from cane work to large rod work. Experiment 1, page 7. This change resulted in an average decrease in production of approximately thirty-seven per cent.

(c) Change from small difficult buff work to more straight-forward rod work. Experiment 2, page 8. This change resulted in an average increase in production of approximately sixteen per cent.

(d) Change from large buff work to smaller rod work. Experiment 3, page 9. This change resulted in an average decrease in production of 0.7 per cent.

ii. The changes which appear to affect the production of particular articles. These are, in inverse order of magnitude -

(a) Change from easy to more difficult fancy work. Experiment 4, page 10. Comparing periods A and C there was a drop in production from 95 pence to 88.5 pence (6.8 per cent.) the output reaching 91 pence on the third day only.

Comparing the periods B and D there was a drop in production from 54 pence to 42.5 pence (21⅞ per cent.) the output reaching 48 pence on the second day only.

(b) Change from large buff work to small rod work. Experiment 3, page 9. Comparing the periods A and C there was a drop in production (neglecting Monday) from 74 pence to 63.5 pence (14.2 per cent.) the output reaching 68 pence on the third day only.

Comparing the periods B and D there was a drop in production from 72.5 pence (neglecting later slump) to 68.5 pence (5.5.per cent.) the output exceeding the maximum of the B period on the second day.

(c) Change from small difficult buff work to more straightforward rod work. Experiment 2, page 8. Comparing the periods A and C there was a drop in production from 56.2 pence to 51.5 pence (8.4 per cent.) the output reaching a maximum on the third day.

Comparing the periods B and D there was a drop in production from 69 pence to 56.5 pence (18 per cent.) the output reaching 57 pence on the second day only.

(d) Change from cane work to large rod work. Experiment 1, page 7. Comparing periods A and C there was a drop in production from 71.5 pence to 63.5 pence (11.3 per cent.), the output reaching a maximum on the third day. The period B was of seven days' duration but the period D was not commenced owing to the illness of the employee.

In practically all cases a gradual increase of production during each period was obtained which was only broken at the week-end, by illness or by change in work. The temperament of the worker also played a large part in the alterations of production due to changes in work.

It would seem therefore that the maximum production can only be obtained when these factors are carefully considered. This will be possible when more experimental data have been collected. In basket-making this increase in production due to careful planning of work would be considerable as the loss during the experiment was in some cases nearly forty-seven per cent. of the maximum output obtainable from the employee. (Page 10.)

In conclusion the Institute wishes to express its appreciation of the help given and the interest shown by Captain Pollard and the Joint Managers.

(Signed) W.H.O'N.Manning.
for DIRECTOR.

17th October, 1929.

FIGURE 1

PLAN OF FACTORY

Ground floor

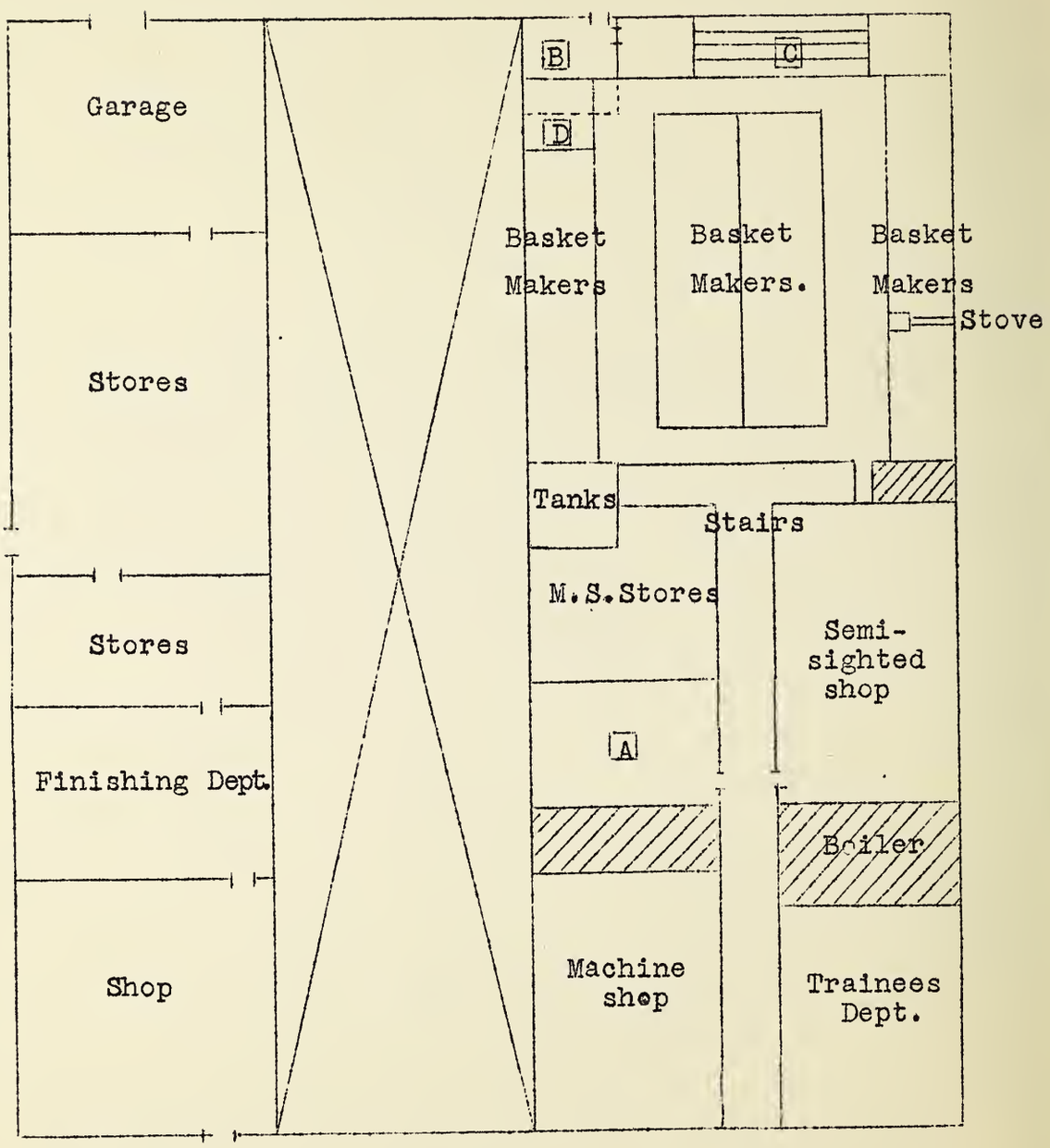
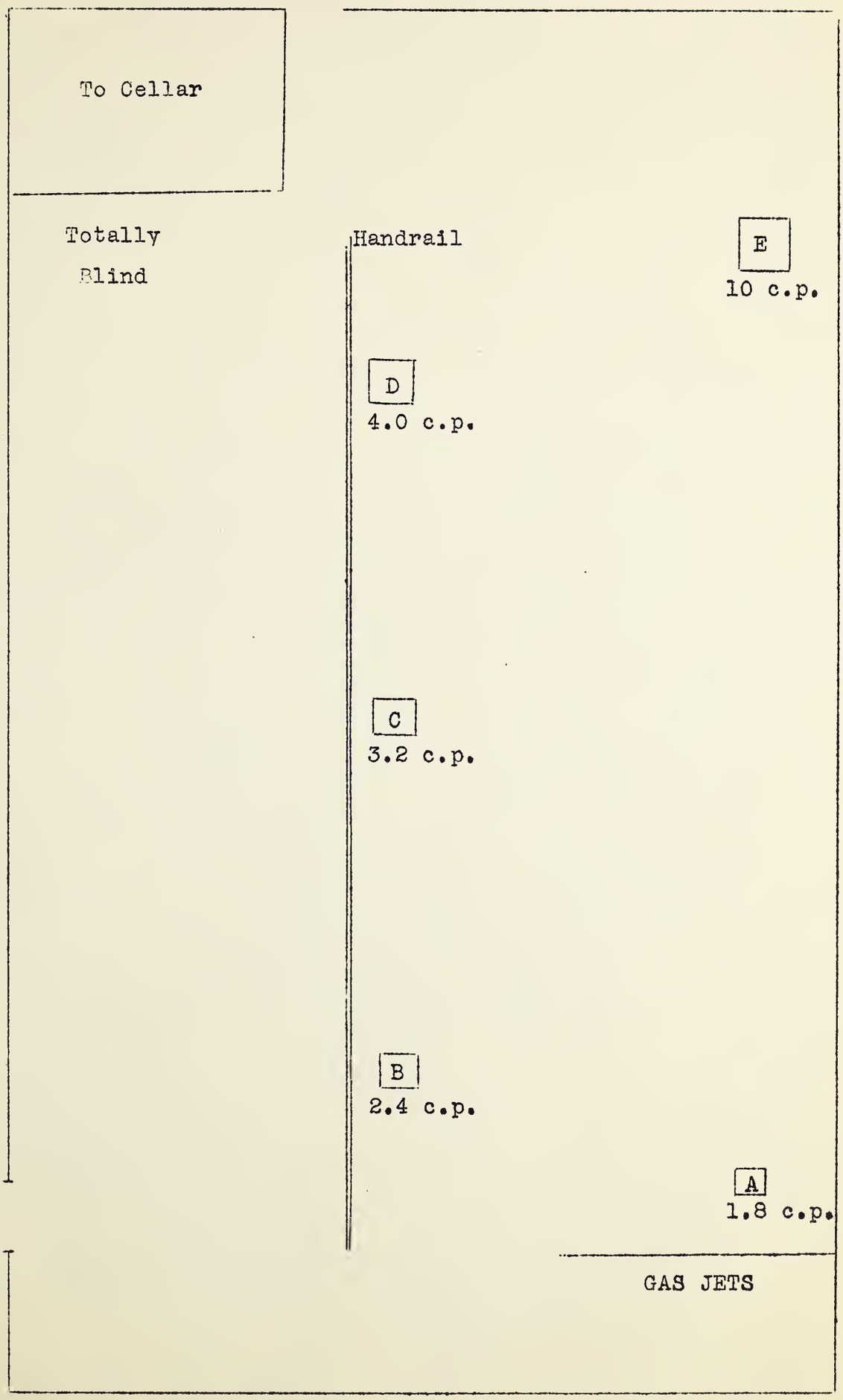


FIGURE 2

SEMI-SIGHTED SHOP.
Lighting Investigation



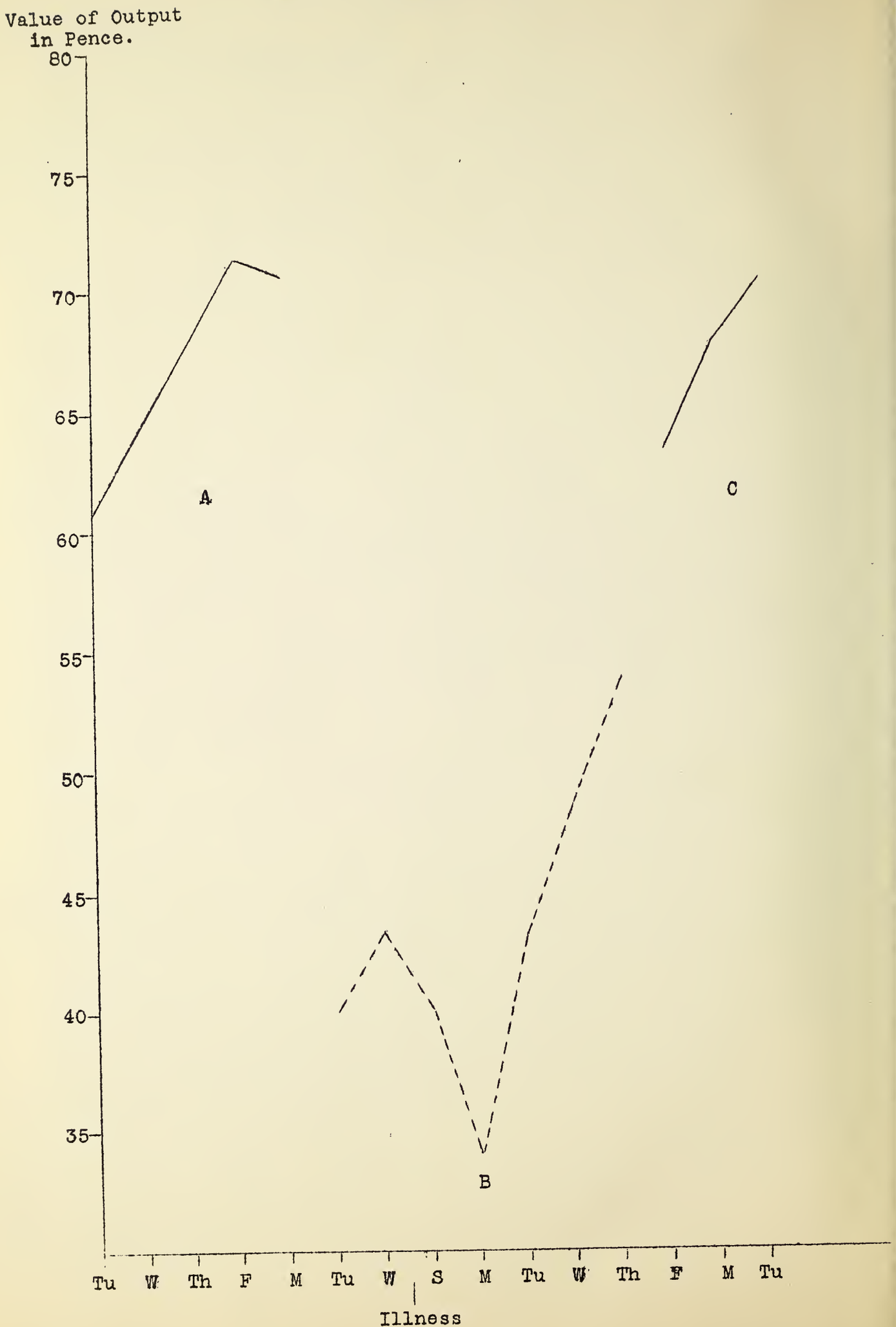
R4.

c.p. Candle power

GRAPH 1

OUTPUT CURVES

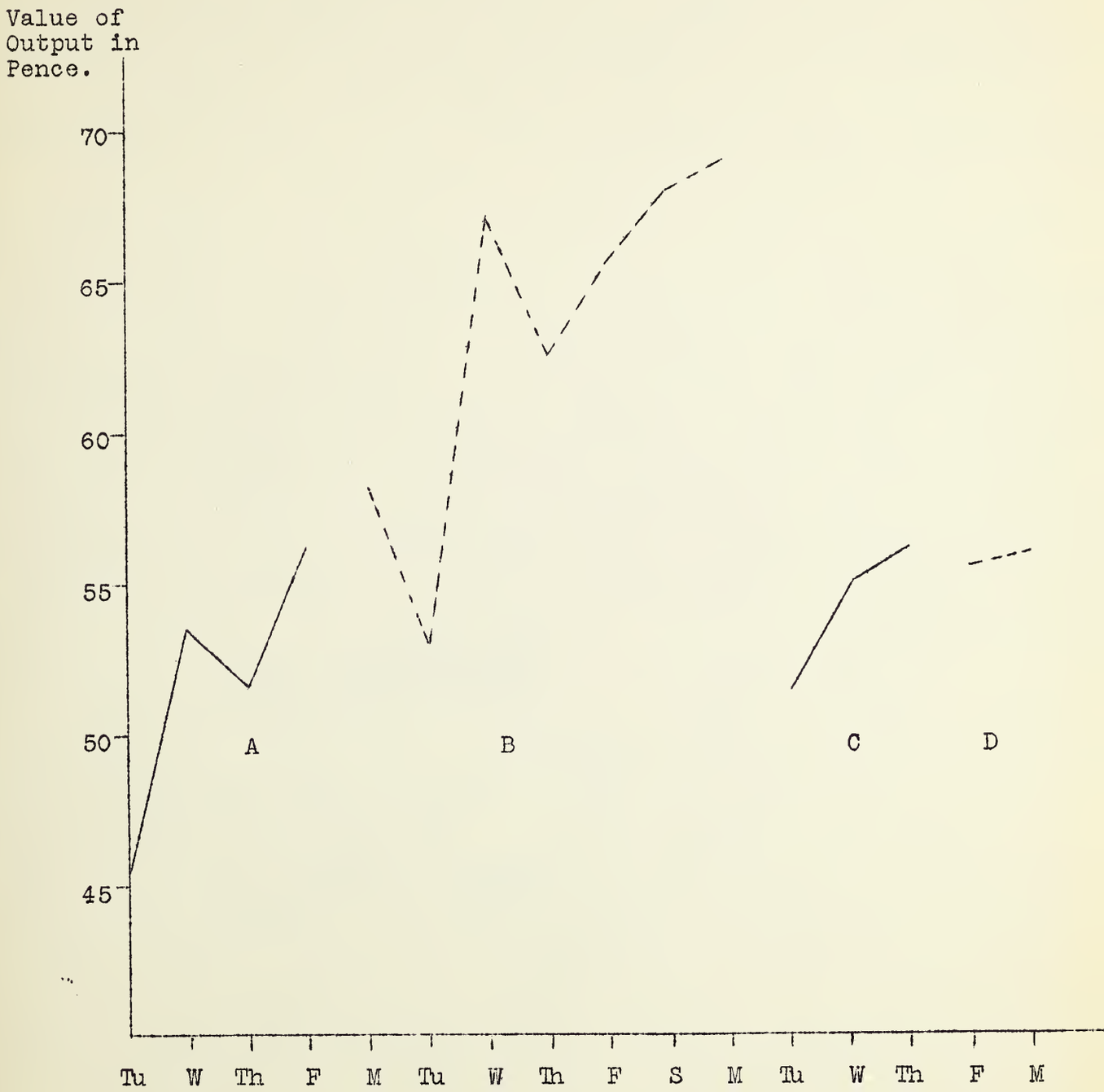
Experiment 1. Change from cane work to larger rod work.



GRAPH 2.

OUTPUT CURVES

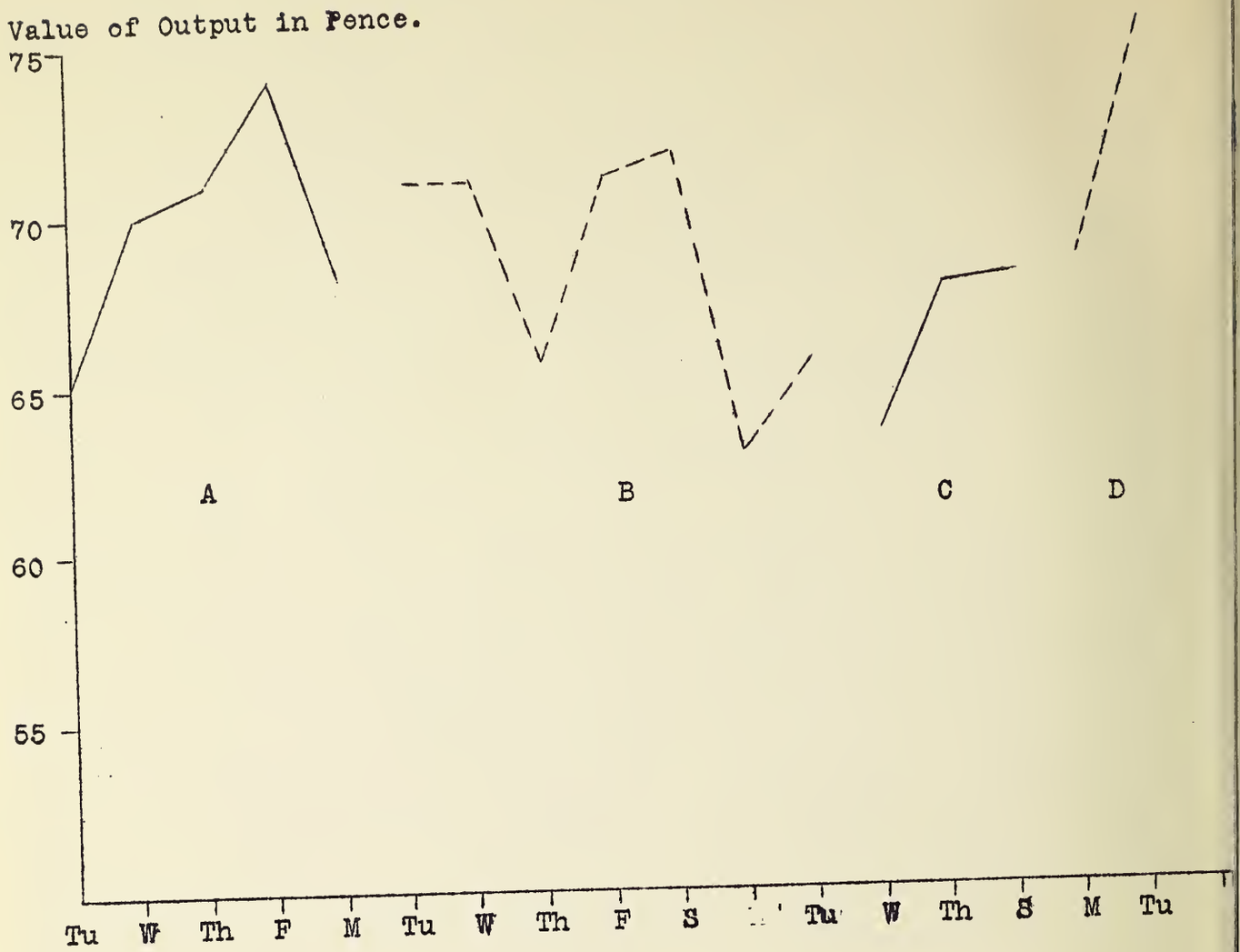
Experiment 2. Change from small difficult buff work to more straightforward rod work.



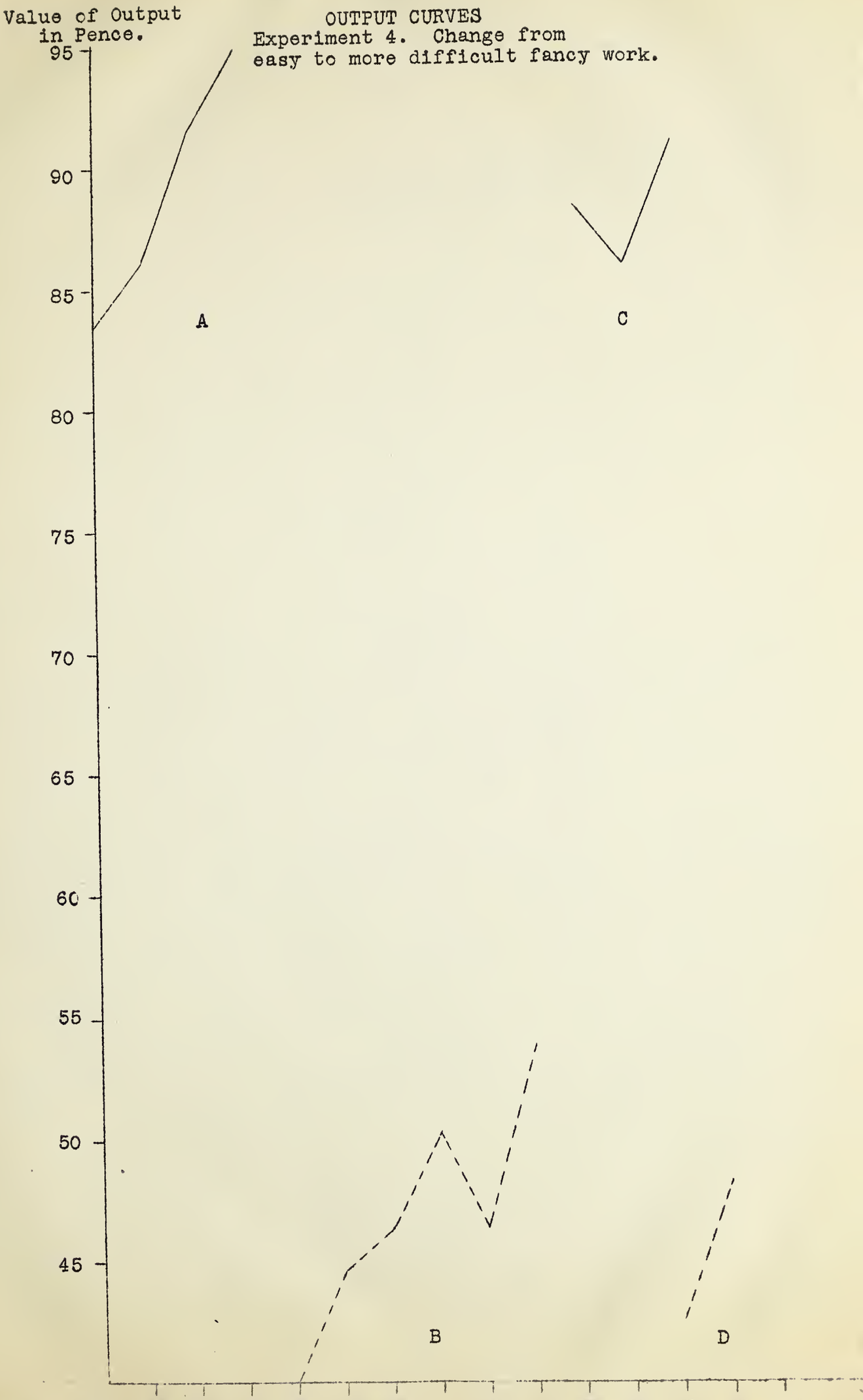
GRAPH 3

OUTPUT CURVES

Experiment 3. Change from large buff work to small rod work.



GRAPH 4


Value of Output in Pence.
OUTPUT CURVES
Experiment 4. Change from easy to more difficult fancy work.
95
90
85
80
75
70
65
60
55
50
45
A
B
C
D
Tu
W
Th
F
M
Tu
W
F
M
Tu
W
Th
F
M

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

SEVENTH
REPORT OF INVESTIGATION
TO

THE NATIONAL INSTITUTE FOR THE BLIND.

BARCLAY WORKSHOPS FOR BLIND WOMEN.

Investigator: C. B. Fox.
Period: 9th October to 7th December, 1929.

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APPENDICES 1 - 8.

I. WEAVING DEPARTMENT.

1. Warping Mill.

Material for weaving is first prepared on a warping mill. For purposes of simplification, we understand, only two threads are used for making the warp (except in the case of Mary Wood, who is continuously employed on this process and who successfully handles four threads). During the journey of the mill (up or down), a definite length of material is wrapped round it, this length being equal to the desired length of finished material. The number of journeys (up or down) travelled by the mill depends on the desired width of the material. The usual widths of cloths woven are eighteen inches, thirty-six inches and forty-six inches. Hence with 22 threads to the inch, material of eighteen inches in width will require 22 x 18 = 396 threads, or 198 journeys of the mill.

Again, the time required to complete a journey on the mill varies with the distance the mill has to travel (according to the ultimate length of the material). Lengths of materials vary considerably more than widths, but it is usually recognised that the time required to prepare a warp on the mill is approximately a whole working day.

The mill is made to revolve round a spindle and is propelled by hand. With totally blind workers we observed that the speed varied considerably , the rate diminishing markedly towards the end of the journey, especially on the 'downward' run. This great reduction of speed was due to the anxiety of the totally blind worker not to go beyond the requisite distance. In order to eliminate this reduction in speed towards the end of the journey of the mill, we devised a temporary 'indicator' to notify the operator when she was just on the termination of her journey. The totally blind workers find this indicator of great assistance in warp making. We recommend, therefore, that a permanent device of this kind - e.g. an adjustable bell indicator - should be fitted to each of the mills for the use of blind workers. In the case of sighted or partially sighted workers such an indicator is not required.

It is difficult to alter the methods in which the blind have already been trained, particularly in this case where the workers are employed on the warping mill about one day only in every twenty. We have attempted, however, to increase the number of threads used at the same time in the case of one worker (Mary Wood) who is permanently engaged on the mill. Employing 6 threads in place of her previous 4, she has already prepared two warps with satisfactory results. We hope that after an adequate period of practice, she will be able to operate her mill with 6 threads at the same rate as before, thus increasing her output by fifty per cent.

2. Bobbin Winding Machines.

The instruments used for winding bobbins are very simple in construction and can be easily manipulated by the blind workers. Owing, however, to the very small diameter ($2\frac{1}{2}$ inches) of the wheel actuating the screw spindle, there is an undue expenditure of energy with each turn of the handle ($2\frac{3}{8}$ inches in radius). We recommend, therefore, that when new bobbin-winders are purchased, wheels of at least 6 inches in diameter should be provided.

3. Drawing-in (Looming).

When the thread has been wound round the warping mill, it is removed, threaded through a reed, and then wrapped round the beam of the loom. The time required to perform this operation varies from girl to girl, and from one to two hours. The threads are then put through 'healds' and again made to pass through a reed of very fine mesh. Only sighted workers are permitted to perform this latter operation. It is a very tedious process, and the workers consider that it strains the eyes. The strands of the reeds are made of bright metal which produces glare. Attempts have been made, without success, to obtain reeds in a dull finish. A reflector for concentrated local lighting with pearl bulbs has been introduced, and the improved lighting thus obtained has helped the operator considerably in her work.

In a recent research into the problems of relieving eye strain in fine work of this kind, it was found that the use of spectacles, specially prescribed to relieve excessive convergence

and accommodation and to correct ordinary visual defects, afforded substantial benefit to the workers concerned and increased output on the average by twelve per cent. Although the work done at the Barclay Shops is much coarser (not exceeding 36 threads to the inch) than that performed in the experiments referred to here, it is possible that the uses of similar spectacles would prove of definite value in preventing or lessening any existing tendency to eye strain.

4. Weaving.

(i) Throwing the Shuttle. Weaving in this workshop is performed by hand . If the shuttle is thrown incorrectly, it sticks between the layers or goes through the thread and falls to the ground. The workers take special precautions to prevent this occurring,by steadying the hand before releasing the shuttle, in order to ensure that it will pass between the layers without mishap. This steadying occupies an exceptionally short period of time - on the average about one-fifth of a second - and it varies with different girls. With some only this momentary steadying effect is noticeable; with others, however, there is a distinct movement as if the shuttle was to be thrown in one clean sweeping action; but the hand is then made to return a short distance, and after an instant's hesitation, the final throw is made. The average overall times taken by workers to throw the shuttle are as follows.

(a) 1.6 seconds to throw a distance of 18 inches.

(b) 1.9 " " " " " " 36 "

(c) 2.3 " " " " " " 48 "

If the hesitation or steadying effect could be avoided, there would be an increase in the production of the workshop for the respective widths by

(a) 1.6 - 0.2 = 1.4 seconds - an increase of 14.3 per cent.

(b) 1.9 - 0.2 = 1.7 seconds - " " " 11.8 " "

(c) 2.3 - 0.2 = 2.1 seconds - " " " 9.5 " "

This point has been explained to the workers, who find it difficult to eradicate the superfluous movement. If, however, a ledge were placed on the loom under the threads, it might serve to

give the workers the requisite sense of security that the shuttle will not ~~pull~~ fall through the threads, and thus enable them to dispense with their present 'protective' reaction.

There are, at the moment, three pupils whom Miss Piper has taught to throw the shuttle without hesitation. We recommend, therefore, that all future pupils be trained by Miss Piper's method. Since this workshop recruits some of its workers from the Barclay Home at Brighton, where complete training is given to the blind, we recommend that this matter should also receive their special attention.

(ii) Use of feet. The looms are provided with three pairs of pedals, though on very rare occasions are more than one pair used. The workers generally employ only one foot; some use the right, others the left, while a few change feet when tired. In only one case were both feet used. The use of one foot only is extremely awkward, and must be more tiring to the worker than if both feet were regularly employed. Moreover, in the initial stages of learning, an undue amount of time is occupied in finding the correct pedals. The latter are made of thin strips of wood of 1½ inches thickness, and where there are three pairs of pedals placed close together, beginners require a great deal of time for learning to select the appropriate pair. To permit the use of both feet, however, the looms will require slight structural alterations. The beam, which receives and winds the completed work, is so placed that when one pedal is depressed by, for example, the right foot, and the left foot is retained on the corresponding pedal, the left knee comes into contact with the material, preventing the pedal from ascending to the limit of its stroke. It is probably because of this obstruction that pupils have been taught to use only one foot. On most of the looms, however, this receiving beam could probably be raised sufficiently to permit free movement of both knees, without interfering with the action of the 'banger'. This alteration is now being carried out on one loom for experimental purposes. We also recommend that the pedals should be increased in width to at least three inches and that vertical guides should be provided to prevent side play and interference

between the pedals in action and those on either side.

(iii) Automatic 'let-down' and 'take-up'. In order to obtain more warp material, the worker has to leave her seat and go to the back of the loom to release or 'let down' the beam on which the warp threads are wound. She then 'takes up' the completed material on another beam at the front of the loom. Time studies have revealed that the quantity of thread 'let down' permits the girl to work continuously for a maximum of about three minutes, when the above process has to be repeated. We are of opinion that with slight structural alterations to the loom, this process of 'taking up' and 'letting down' could be performed by the worker while she is at her seat. This would save that portion of the total time (about ten per cent.) spent by the worker going to the back of the loom every two to three minutes.

In light repetitive work of this type, we are of opinion that short working spells of two to three minutes do not permit the operator to develop a natural working rhythm. It has been suggested that the break after two to three minutes work to 'let down' more material serves as a useful rest-pause and prevents a tendency to monotony. We agree that definite rest-pauses in work of this character are essential, but we do not consider that any advantage is gained when they are taken at such frequent intervals. We strongly recommend, therefore, that an attempt should be made to introduce a satisfactory 'take up' and 'let down' mechanism which will work automatically. Such a mechanism would eliminate the frequent involuntary stoppages which at present occur, and would effect a very substantial reduction of unproductive time. The introduction of suitable rest-pauses could be considered on the basis of a careful scientific study of individual working curves.

(iv) The Fly-Shuttle. On the existing arrangement, the action in throwing the shuttle - particularly with a wide piece of material (48 inches) - is a very awkward one and must cause considerable fatigue. We understand that the rate of working when

a fly-shuttle is used is about three times as great as that when a loom worked by hand is used. To operate the fly-shuttle it is necessary only to pull a string at the centre of the loom in order to send the shuttle through the warp. We believe that this movement could be made more easily by a blind worker than that required to throw the shuttle.

We are aware that the fly-shuttle loom has been tried in the workshop, and has been considered unsuitable. On making detailed enquiries, however, particularly from the girl who was the subject of the experiment, we found that the objection to the loom was due chiefly to the method adopted for an automatic 'let down' and not to the operation of the fly-shuttle. Further, the girl was taught to manipulate the shuttle by a representative from the firm which supplied the loom. This man, however, was probably unsuited for the work of instructing the blind, for the girl herself states that she was quite "unnerved" throughout the period. With proper instruction, therefore, we feel convinced that the advantages of a fly-shuttle loom over a hand-loom would soon be demonstrated, since

(a) the movements required to manipulate a fly-shuttle are much easier and quicker than those required to throw a hand-shuttle,

(b) a very short period of training would be necessary to teach the workers to pull the string as compared with the period now required by them in learning to throw the shuttle, and

(c) the output of the loom would be approximately three times as great as at present.

The firm which offered to supply the loom with fly-shuttle to the workshop required £40 per loom. We have, however, discovered a very capable loom-maker (S. Maddox, 15 Norton Street, Green Street, Bethnall Green) who supplies looms to the School of Arts and Crafts, and to the Spitalsfield Works. He will supply a similar loom with all accessories (shuttles etc.) for about £15.

In recommending the installation of a fly-shuttle, we may mention that a larger floor-space will be required. An extension

of from 14 to 18 inches on both sides of the loom will be necessary for the shuttle. This means that each fly-shuttle loom will require an additional three feet (in width) of floor space. Though the extra floor space thus required will probably reduce the number of looms possible by one on each floor[1], we are convinced that the total output obtained from the slightly smaller number will be much greater than can be now produced.

(v) Provision of better seating accommodation. When the automatic 'take-up' and 'let-down' mechanism and the fly-shuttle are installed, it will be possible to devise greatly improved seating arrangements at the looms. The present stools are defective in several important respects; but owing to the existing conditions and methods of work, properly designed seats cannot be effectively introduced, until the changes mentioned have been carried out.

II. KNITTING DEPARTMENT.

The Knitting Department is on the first floor, and consists of two rooms - one for the blind girls and the other for the finishers. For purposes of differentiation, the room with blind workers is called the workroom.

In the Workroom, there are twelve knitting machines, only eleven of which have been used during the period of the investigation. Each machine is operated by one girl, who is supplied with bobbins, which are wound at one end of the room.

1. Bobbin winding.

A Harrison Machine is used for winding three bobbins at a time, and on this, a totally blind worker is employed. There are also several single hand-machines, which are utilised

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[1] Number of looms in workshop.

Ground Floor,	2 rooms,	13 looms.
First Floor,	1 room,	9 looms.
Second Floor,	1 room,	10 looms.
Third Floor,	2 rooms,	15 looms.
	Total	47 looms.

by the machine operators. It is undesirable, however, to permit the latter girls to wind bobbins, owing to the resultant unproductive time of their machines. In order to enable the machines to be run continuously, a young sighted girl was engaged for the specific purpose of winding bobbins and placed at one of the hand-machines. Observations showed, however, that the triple machine was not being used to its fullest extent. The totally blind girl might start winding three bobbins at the same time, but the thread of one, and sometimes two, would break, without being noticed by the operator. We recommend, therefore, that the normally sighted girl should be employed at the Harrison machine and that the blind operator should be transferred to a hand machine. This arrangement has been adopted and is now working satisfactorily.

(i) The triple machine. When three bobbins were being wound on the triple machine, there were innumerable stops owing to the tangling of skeins. Rough timings on two occasions showed that the machine was working for only fifty-three per cent. of the total time; the rest of the period was employed by the operator in unravelling the skeins. Skeins were formerly left on the table in haphazard fashion, and this appeared to be the cause of their entanglement. To prevent this, therefore, we proposed that pegs should be arranged on the wall alongside the table, and that immediately skeins were opened from the manufacturers' packages, they should be hung on these pegs. This method is now in operation and has proved very successful in eliminating the source of difficulty mentioned. Part of the unproductive period of the machine was due to threads breaking. The grooves etc. of the skeiners became clogged with pieces of wool etc., and consequently did not revolve easily, since this caused severe tension on the wool. The skeiners are now kept clean, and the machine oiled to ensure smooth running. We recommend that they should be systematically maintained in this condition.

Appendix 2 indicates the number of hours per week spent by the knitting machine operators on bobbin winding. The

alterations mentioned above were introduced in the middle of the week ending on the 14th November, 1929. It will be noticed there was an immediate reduction in the number of hours spent by the machine girls on winding bobbins and that the reduction has continued, from an original average of over forty hours per week to less than one hour per week, as shown by the latest records. The time thus saved is now available for productive work on the machines.

If the output at present obtained by the two bobbin winders is likely to be insufficient at any period to keep the whole staff of machine operators supplied with material, another girl should be engaged for winding bobbins.

Prior to the investigation, as the output from the bobbin-winding machines was incapable of meeting the demands of the department, the management had arranged to obtain some of their yarn in 'cheeses' instead of in skeins. The yarn in a 'cheese' form did not entangle, and was, therefore, a great help to the department; but the management had to pay an additional four pence per cheese (1 cheese = 1 lb.). In view of the increased output now obtained from the triple machine, we consider that the bobbin-winding machines can cope with the present requirements of the department in skeins. We therefore recommend that the yarn be brought in skeins only, thus saving the former additional expenditure on 'cheeses'.

2. Circulation of Bobbins.

(i) Old system. An inspection was made of the machine lockers, which were found to contain a considerable number of partly-filled bobbins. The material on these partly filled bobbins was no longer required for immediate use, and had to be 'skeined off' to permit the bobbins to be used for fresh material. This 'skeining off' was performed only when the particular machine operator concerned required fresh material, and could not find an empty bobbin. 'Skeining off' was, therefore, always deferred until this emergency arose.

(ii) New system. On our recommendation, all bobbins are now under the care of the triple-machine winder. The empty bobbins

are placed on her table, while those which are filled and ready for use are placed in a special cupboard. All partly filled bobbins which ~~are~~ require to be 'skeined off', are also given to the triple machine winder, who places them on another shelf of this cupboard. It is the duty of the bobbin-winders to 'skein off', and machine operators are not permitted to do this work except during waiting periods when their machines are unavoidably out of action.

The material 'skeined off' is handed to the supervisor, whose duty it is to weight the quantity, to record the weight in the issue book against the garment for which the material was used, and to place the material in the reserve cupboard. There is now a place reserved for full bobbins; for partly filled bobbins; for the garments which are not yet passed; for partly filled bobbins requiring 'skeining off'; and for pegs on which to hang skeins.

3. Standardization of Yarn Requirements.

Among the partly filled bobbins which required 'skeining off' it was noticeable that some had very little yarn left on them while others held considerable quantities of yarn. The difficulty of ascertaining the exact length of yarn to be issued for specific garments is recognised; but we feel that for economy and for preventing double handling of material, a systematic effort should be made to determine the minimum requirements for the standard garments made. For this purpose, we have prepared a special form (see Appendix 3) on which the weights of standard garments in various yarns will be recorded. After a careful inquiry based on controlled conditions, the corresponding minimum weights of yarns should be ascertained and similarly recorded.

There is no indication of how much time was spent by the bobbin-winders on 'skeining off', nor the time spent in winding this superfluous material. But for the weeks ending on the 28th November and on the 5th December 1929, 18¼ and 9½ hours respectively were spent by the machine operators on 'skeining off'. The reduction of excess issued material to a maximum should effect a substantial saving of the time and labour at present involved in winding and in 'skeining off'.

One example of the excess of material issued may be mentioned, which will illustrate the scope for improvement in this direction. The records of the department, on the 26th November show that 1 lb. 1½ ounces of wool were issued to make a cardigan, but of this quantity, no less than 5 ounces were returned unused. That is, the garment only required 12½ ounces and forty per cent. was issued in excess. On the next occasion on which a cardigan of approximately the same measurements is required, not more than 14 ounces of wool should be issued. The quantity issued can be reduced to the nearest skein (a skein usually contains 2 ounces of material). The additional time and labour spent in winding and 'skeining off' of the excess material will thus be largely saved.

4. Sighted Supervision.

There are three sighted assistants, and it is their duty to assist the workers when in difficulties. In addition, they are expected to do a certain amount of finishing.

During the investigation, the whole department was working at high pressure, and even the "Departmental Charge" had to perform a certain amount of finishing. There were ten machine workers and a beginner in the department, but the assistants were so exceptionally busy that they were unable to devote much time to instructing the pupil.

(i) Present procedure. A machine hand calls for an assistant immediately she is in difficulties. An assistant, when available, attends to the worker; but no time is available for an explanation by the assistant as to how to avoid the difficulty , on future occasions. The demands on the three sighted assistants are so great that they have insufficient time to perform their own finishing duties and one of these girls has been permitted to take work home. This is a form of overtime which is very undesirable as it tends to make the worker 'stale' and unfit for her duties. If the work cannot be completed by these three sighted assistants, we recommend that an additional assistant be employed to cope with it.

The demand on the sighted assistants by the machine hands is so great that machine workers are continually having to wait their turn for attention. These waits are usually of small duration (only those extending to fifteen minutes and beyond are recorded in the Time Sheets), but they occur fairly frequently. Time studies of five machines only show that on three occasions the period of waiting was ~~twelve~~ /12/ minutes ten seconds or 16.15 per cent of the total time (see Appendix 4). Beside the loss in production time involved, these waiting periods tend to annoy the workers and so further lessen their efficiency.

(ii) Proposed procedure. It would seem that if the work continues at this pressure, it would be far more economical to employ another sighted assistant. During the period of the investigation, a young sighted assistant was taken on the staff, but she came without any previous knowledge of the industry. She had therefore to receive training before she could give definite instructions to the machine workers, and this was an even greater strain on the whole staff of the department. The young assistant, however, failed to return after the first day's work.

All the sighted assistants have been recruited at a very early age and have grown up in the same environment. They possess, in the main, the same ideas of management and methods of assistance at present in existence. We consider that it would be beneficial to the department if an assistant were recruited who has had previous knowledge of the business. She would then bring in new ideas (from the sighted world) which might be applicable to that department.

Four sighted assistants would then be regularly[1] employed in place of the present three. Of these four, we recommend that one be employed wholly on 'finishing'. If she is unable to cope with the requirements, one of the remaining three can be deputed to assist her at definite periods and not at haphazard varying

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[1] During the Christmas rush period only a fourth assistant is temporarily engaged.

intervals "when the work permits". Owing to the great demands of the machine hands on these three assistants, it was difficult to estimate whether one girl would meet the requirements of the department if wholly allocated to 'finishing'. The remaining three assistants should act as supervisors and be styled accordingly. Instead of attending to machine hands only when mistakes have occurred, we recommend that they should remain in the department continuously with the machines. They should ascertain whether machine hands are following their instructions correctly; they should see that the correct tension of the yarn on the machine is being strictly adhered to; they should warn machine operators when their bobbins are becoming empty; they should pay more attention to those machine operators who are liable to have difficulty in obtaining the change in shape of ~~thin~~ chiu garments, and in particular to those machine workers who are considered below the average. By this method, several of the mistakes usually made by the workers will, we think, be prevented and many errors already made will be detected before the garment is completed. This will greatly reduce the unproductive time at present involved in rectifying major mistakes.

We also recommend that one of these supervisors be selected to understudy the lady in charge of this room. At the moment, she prepares all the instructions for the machine hands, but none of the assistants understand how these instructions are prepared. Should an illness prevent the lady in charge from attending work, the department would be put to considerable inconvenience by her absence.

5. Non-Productive Work.

A considerable proportion of time on the machines is spent on non-productive work. This occurs when the shape of the garment is incorrect and alterations have to be made. Appendix 5 indicates the time in hours per week which is spent on these alterations.

The shape or making of a garment may have to be altered for any one of the following reasons.

(i) Errors due to defective fitting

(ii) Incorrect instructions given to machine-hands

(iii) Instructions not adhered to by the machine operators

(i) Errors due to defective fitting. The mistakes which occur under this heading are due mainly to the assistant in the 'shop' taking wrong measurements. Though these errors are not frequent the management pay for the work involved in rectifying them and thus have to suffer a double loss.

(ii) Incorrect instructions given to machine operators. When the garments from the machine-hands are returned to the lady in charge she measures them to determine whether they have been prepared to the correct dimensions. It may then be discovered that the garment has to be altered, owing to the fact that the instructions originally given to the operator were incorrect. It is recognised that the preparation of these instructions for the machine workers is not an easy matter, but we are of opinion that a higher standard of accuracy should be possible than is attained at present. Appendix 5 shows the time spent by the ten machine-hands (excluding the pupil) in a working week of forty-three hours. For the six weeks given, an average of about eleven per cent. of the possible productive time was lost in this way. This loss is a double one; for since the machine-hands are not at fault, they are paid for the work on these alterations. The management thus lose, in actual time, the number of hours spent on such alterations, and pay for the alterations made to the garments. A special effort should, therefore, be made to ensure that instructions to workers are as accurate as the nature of the work permits.

Taken together, Appendices 5 and 6 give the total non-productive machine hours spent each week in the department (see bottom of Appendix 6). This non-productive time (approximately 89.2 hours per week) is 20.7 per cent. of the total working time, and permits of the machines being used for only 79.3 per cent. of the ~~average~~ working ~~week~~ – ~~equivalent to the loss of two machines out of ten~~

(iii) Instructions not adhered to by the machine-operators. The actual time spent on rectifying the errors made by workers is not recorded; if it were the figures in Appendix 5 would be considerably greater. We feel however, that the proposal for the supervisors to remain continuously with the machines, watching the work closely, should reduce the unproductive time here involved to a minimum. All errors made by the worker are rectified by her and she is not paid for the additional time thus required; but the management suffers the loss in productive time taken to rectify the errors. This loss of time should, therefore, be debited to lack of supervision, and the proper remedy should be sought in this quarter.

6. Waste Material.

In a factory employing blind labour, the proportion of material wasted is greater than that wasted by sighted labour. In this department, however, no information is available of the extent of this waste. Such information, however, is essential for at least two reasons: it permits of greater accuracy in costing; and it should provide an incentive to minimise waste.

At present, for the purpose of ascertaining the cost of production of any garment the finished article is weighed. The result is taken as the weight of raw material (yarn) used, and the garment is costed accordingly. No direct charge is shown for waste of raw material, though allowance is made by increasing the cost of the known quantities of raw material, labour etc. on a definite percentage basis. Since, however, accurate data of waste are easily obtainable, we recommend that they should be systematically recorded and sent to the costing department.

7. Machines.

(i) Gearing of machines. There are twelve knitting machines of which eleven are of the Dubied type, and the remaining one of the Harrison type. Both types operate on the same principle.

These machines are operated by moving a hand lever from side to side across the front of the machine, causing the carriage to travel in corresponding directions. When, as frequently happens,

the carriage has to traverse the full length of the machine, the operator has to move the handle a distance of fifty-two inches in both directions. The movements required are awkward and sufficiently exacting to induce heavy breathing after a working spell of ten minutes. In view of the obviously fatiguing nature of the work involved in operating these machines, we strongly recommend that an inquiry into their design should be undertaken with a view to introducing suitable modifications (e.g. a system of reduction gearing) to minimise the force and extent of the arm and body movements required.

(ii) Introduction of Braille Numbers. Since the instructions for work on these machines are given in numbers of needles, the workers should be able to count the needles quickly. Ordinarily a blind girl has to feel each needle for this purpose, but we consider that an appreciable proportion of time would be saved if braille letters were placed on the Dubied machine below every fifth needle, or below every tenth needle as on the Harrison machine. We recommend, therefore, that this modification should be introduced as soon as possible.

(iii) Cleaning the machines. The superficial cleaning which machines occasionally receive fails to remove all the dirt from the bed of the needles; and it is considered that in some cases this accumulation of dirt causes a change of tension on the wool. We understand that at the Barclay Home in Brighton each machine is thoroughly cleaned and oiled once a term. This process, however, occupies one whole day per machine. As the management here could not afford to allow this period of unproductive time, we recommend that a quicker method of cleaning be adopted - e.g. by the use of an air-compressor such as is employed for cleaning back axles in motor works.

III. ARTIFICIAL ILLUMINATION.

The finishers of the Weaving Department require a well-focussed intensive light for their work. On our recommendation Holophane Industrial Reflectors (No.AI.3017) have been provided, and fitted to 30 watt lamps hung directly over each of the six working positions. All the workers have expressed their satisfaction with the new system.

In the Finishing Room of the Knitting Department, the amount of light provided is adequate for the work, but two of the finishers have complained of headaches due to glare. We have therefore replaced the ordinary vacuum lamps previously used in these cases by pearl lamps. The latter type eliminate glare and the workers appear to be pleased with the change.

IV. METHODS OF REMUNERATION.

The method of payment adopted in these workshops is on a piece-rate basis with a minimum wage of 22/9, plus a special augmentation of 7/-, making a total of 29/9 weekly. When a worker's earnings for any week exceeds the basic wage of 22/9, the balance is credited to her account and paid in the form of a bonus at the end of the quarter. If, on the other hand, her earnings for any week fail to reach the basic amount, the debit is duly recorded and if her account remains debit at the end of the quarter the deficit is automatically wiped out.

We suggest that a more effective incentive would be obtained by the <u>weekly</u> payment of part or of the whole of the bonus earned in addition to the minimum wage and augmentation. As, however, it would be difficult at present to apply this method to the Weaving Department, where a weekly output cannot always be assessed, we recommend that it be introduced in the Knitting Department only, as an experimental measure for the next quarter.

In introducing this change, it might be desirable in the early stages to pay weekly only 50 per cent. of the bonus earned, the balance being accumulated and paid quarterly.

In this connection, Appendices 7 and 8 may be reviewed. These give the total bonuses paid (or lost) for the past six quarters. It will be seen that 67.5 per cent. of the Weaving Department received a bonus covering the period of eighteen months, while only three out of a maximum of ten of the Knitting Department were in receipt of one. D. Wells, a fairly new worker when these data were compiled, has shown a decided increase each quarter, and is now actually in receipt of a bonus. With her inclusion, however, only forty per cent. of the Knitting Department are in receipt of a bonus. In view of this fact, the adoption of the above proposal deserves special consideration.

V. WAGE EARNING CAPACITIES OF TOTALLY AND PARTIALLY BLIND WORKERS.

Appendices 7 and 8 give the amount of bonuses earned or lost by the workers in the two workshops - Weaving and Knitting respectively - for the past six quarters.

While apparently, no significant general conclusion regarding the relative earning capacities of blind and partially sighted workers can be drawn from these results they may prove valuable in connection with future research into this interesting problem.

In conclusion, we wish to acknowledge the co-operation afforded us throughout the investigation. We are specially indebted to Mrs. Hattersley and Mr. H. J. Wagg whose assistance was much appreciated.

(Signed)Harry Ward.
For Director.

27th December, 1929.

APPENDIX I.

DETAILED TIME STUDY (IN SECONDS) OF AN AVERAGE GIRL ON LOOM.

Time 11.05 - 11.55 a.m. = 50 mins.

Working Loom.	Putting in and changing fresh bobbins.	Broken thread.	Cutting and examination of material etc.	'Letting down' and 'taking up'	Measuring
162 5 30 80	80 30 38 28	52	120 64 (184)	10 25 36 35	35 35 25 23 (118)
63 180 13 128	18 65 65 23			60 18 30 410 (discovered string broken)	
140 92 10 80	20 70 26 50			30 (654 seconds.)	
110 23 50 107	513 seconds.				
150					
Total 1423 seconds					

Voluntary Rest Pauses.

25 20 (45)

Actual Weaving Time 1423 seconds out of a total time of 3000 seconds or 47.4%

APPENDIX 2.

TIME (IN HOURS) OCCUPIED BY MACHINE-HANDS IN WINDING BOBBINS.

Names.	Week ending 24/10	31/10 absent 3 days	7/11		14/11	21/11	28/11	5/12	12/12.
E. Locke	absent	$\frac{3}{4}$	3		1	$\frac{1}{4}$	$\frac{1}{2}$	-	-
B. Richards	7	3	$1\frac{1}{2}$		$3\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{2}$	-	-
D. Corcoram	$3\frac{1}{4}$	$2\frac{1}{2}$	$1\frac{1}{2}$		$2\frac{1}{2}$	$\frac{3}{4}$	1	-	-
E. Jordan	$2\frac{1}{4}$	2	3		$2\frac{1}{2}$	$3\frac{3}{4}$	-	-	-
R. Richards	$6\frac{1}{2}$	8	$8\frac{3}{4}$		5	$2\frac{3}{4}$	-	-	-
V. Blayney	$3\frac{1}{4}$	$6\frac{1}{4}$	$7\frac{1}{4}$		$6\frac{3}{4}$	$2\frac{1}{2}$	-	$1\frac{1}{4}$	$\frac{1}{4}$
W. Wratton	$6\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{4}$		$9\frac{1}{4}$	$3\frac{1}{4}$	$1\frac{1}{4}$	-	-
D. Wells	$3\frac{1}{4}$	3	$3\frac{1}{2}$		$1\frac{1}{2}$	1	-	-	-
I. Faircloth	3	$4\frac{1}{4}$	$4\frac{1}{2}$		$3\frac{3}{4}$	3	$\frac{1}{4}$	-	-
H. Perham	$4\frac{1}{2}$	$4\frac{1}{2}$	$6\frac{1}{2}$		$3\frac{1}{4}$	$2\frac{1}{4}$	-	-	-
Total	$39\frac{1}{4}$	$39\frac{3}{4}$	$44\frac{3}{4}$		39	$20\frac{3}{4}$	$3\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{4}$

Commencement of Experiment.

N.B. The working week up to week-ending on the 31st October, 1929, consisted of 39 hours - later 43 hours. The bobbin-winding improvements were introduced in the middle of the week ending on the 14th November, 1929.

APPENDIX 3.

RAW MATERIAL REQUIRED FOR STANDARD GARMENTS.

GARMENTS.	WOOL 2/14		WOOL 2/22		WOOL 2/28		S/W 2/16		S/W 2/28		KASHA		BOUCLE	
	Weight of garment	Material required	Weight of garment	Material required	Weight of garment	Material required	Weight of garment	Material required	Weight of garment	Material required	Weight of garment	Material required	Weight of garment	Material required

APPENDIX 4.

WAITING PERIODS ON FIVE MACHINES FOR A TOTAL PERIOD OF FIFTY MINUTES.

	29/10/1929.	31/10/1929.	1/11/1929.
Total Period of Waiting for Attention.	66 mts. 32 secs.	37 mts. 25 secs.	17 mts. 13 secs.
Total Period of Attention Paid by Supervisors.	140 mts. 19 secs.	45 mts. 30 secs.	62 mts. 5 secs.
Total Period Machines not working.	206 mts. 51 secs.	82 mts. 55 secs.	79 mts. 18 secs.

Total average period of waiting for attention over one hundred and fifty minutes each for five machines or seven hundred and fifty minutes.

66 mts. 32 secs.
37 mts. 25 secs.
17 mts. 13 secs.

121 mts. 10 secs. or 121.17 mts.

Therefore Waiting Period for Attention only is 16.16 per cent.

R360

APPENDIX E.

TIME (IN HOURS) SPENT ON ALTERATIONS MADE TO GARMENTS.

Names.	Week ending 7/11/1929	14/11/1929	21/11/1929	28/11/1929	5/12/1929	12/12/1929	Total.
E. Locke	6¾	6	6¼	10½	5	6¾	41¼
B. Richards	6	3½	2½	1¾	4	1	18¾
D. Corcoran	10	8¼	8¾	5¾	10¼	4¾	47¾
E. Jordan	1½	3¼	6	3¼	1¼	8½	23¾
R. Richards	7¼	7¼	11¼	1¾	6¼	7¾	41½
V. Blayney	2	7	2¼	2¼	3½	3¾	20¾
W. Wratton	4¾	1½	4½	5	3¾	5½	25
D. Wells.	-	3¾	6	2½	15	½	27¾
I. Faircloth	2	3½	5½	1¼	4	3¼	19½
H. Perham	1½	5¾	3¼	6½	5¾	1¼	24
Total	41¾	49¾	56¼	40½	58¾	43	290

APPENDIX 6.

LENGTH OF PERIOD (IN HOURS) DURING WHICH MACHINES WERE IDLE[1]

[1] This period includes winding, skeining off, cleaning machines and waiting periods.

Names.	Week ending 7/11/1929	14/11/1929.	21/1/1929	28/11/1929	5/12/1929	12/12/1929.
E. Locke	3¼	1	¼	3¾	1¼	2¼
B. Richards.	3¾	3½	2½	2¾	2½	5¾
D. Corcoran	2	2½	3	5½	3¼	1¾
E. Jordan	5¼	2½	4½	2¼	1¼	2
R. Richards	9¼	5¾	4¾	6¼	4½	5¾
V. Blayney	8¼	6¾	4½	1	4¾	4½
W. Wratton	7¼	11¾	7¾	4	3½	3¾
D. Wells.	5	3¼	1	4½	3½	4¼
I. Faircloth	4½	3	3	1¼	1½	1¾
H. Perham.	6½	3½	2¾	4¾	5	4½
Total Unproductive times given in Appendix 5.	55	43½	34	36	31	36¼
	4¼	49¾	56¼	40½	58¾	43
Total Non-Productive Machine Hours.	96¾	93¼	90¼	76½	89¾	79¼

APPENDIX 7.

Statistics - Weaving Department,
27th November, 1929.

Order of Earnings.

Name.	Total Earnings or Losses for six Quarters ended Sept. 1929. Losses underlined.	Sight.
R. Sarti	£36. 3. 2½	3/60
L. Hack	29. 18. 6	Hand movements at 6"
L. McCullock	29. 6. 10½	Nil
M. Wright	28. 12. 3½	Nil
H. Tunnicliffe	28. 12. 3	Perception of light
H. Jenner	25. 16. 4½	5½/60
J. Westcott	20. 17. 1½	12½/60
M. Simpson	20. 12. 11	8/60
H. French	15. 18. 4	1/60
G. Ewington	15. 7. 10½	1/60
G. Peake	13. 4. 3½	10/60
O. Bristow	13. 3. 5½	5/60
M. James	12. 17. 6	1/60
E. Couzens	11. 5. 8½	3/60
D. Cobb	11. 0. 2	1/60
B. Hillman	10. 0. 10½	3/60
D. Dunkley	9. 16. 6½	Slight perception of light
D. Whitehead	7. 17. 3	1/60
C. Foster	7. 14. 6	2/60
A. Jones	7. 13. 10½	3/60
M. Bragg	7. 10. 8	5/60
E. Devoy	6. 7. 8½	3/60
H. Wilkes	3. 10. 11	2/60
S. Whitmarsh	3. 2. 10½	Nil
L. Tucker	2. 17. 8½	Slight perception of light
A. Collins	2. 16. 10½	" " " "

Name.	Total Earnings or Losses for six Quarters ended Sept. 1929. Losses underlined.	Sight.
D. Cutler	£1. 17. 2½	8/60
C. Pritchard	-. 12. 2	5/60
M. Botwright	3. 13. 10½	3/60
E. Manning	4. 3. 9½	Nil
E. Faircloth	4. 19. 10½	Very doubtful perception of light
V. Smith	7. 18. 3	
F. Huggins	9. 8. 11½	Slight perception of light.
W. Hayes	10. 17. 8½	½/60
B. Blower	11. 2. 6½	Slight perception of light.
M. Norgrove	19. 3. 9	Nil
F. Cope	20. 8. 3	Nil
I. Crosskey	22. 2. 9	7/60
D. Currell	26. 6. 7½	Nil
D. Whitton	34. 0. 9	Slight perception of light.

APPENDIX 8.

Statistics - Knitting Department
27th November, 1929.

	Name.	Age	Total Earnings or Losses for six Quarters ended Sept.1929. Losses are underlined.	Joined Workshop	Sight
Earnings.					
Machine Workers	E.Lock	45	£21. 7. 10	19.9.14	Doubtful perception of light
	E.Jordan	26	21. 7. 2½	27.8.26	Nil
	B.Richards	42	7. 11. 4	14.1.16	Nil
	D. Wells	21	4. 13. 0	18.7.27	Nil
	R. Richards	46	10. 14. 8	4.1.22	Doubtful perception of light
	I.Faircloth	29	10. 18. 4	26.8.27	Slight perception of light 12½/60
	D.Corcoran	29	12. 7. 4½	-. 3.28	
	W.Wratton	25	13. 14. 1½	11.1.27	Slight perception of light. 1/60
	V.Blayney	42	17. 6. 5	1.8.12	
	E.Ayles (Triple Machine)	48	22. 8. 0.	1.8.12	Doubtful perception of light.